TELEPHONY

Volume XVIII CHICAGO, JULY 4, ...

Absolute Security

enabled. Under [illegible] ask [illegible] pounds [illegible] Stock [illegible] over $[illegible] [illegible]

[illegible] Nation[illegible] [illegible] but [illegible] [illegible] hour. It [illegible] every [illegible]

He Is Absolutely Sure of His ... and Principle

The Automatic Telephone C... to Your Investor

The Au[illegible] against [illegible] [illegible] work and the cost of [illegible] and [illegible] [illegible]

It guards against public [illegible] [illegible] the best service.

It [illegible] for public [illegible] fair prices [illegible]

It [illegible] for the Automa[illegible]

It reduces idle investment [illegible] and makes [illegible]

It [illegible] increases [illegible] business grows, and [illegible] mean more [illegible]

You [illegible] whom you seek [illegible] will help [illegible] [illegible] enough [illegible] them [illegible] any difference [illegible]

AUTOMATIC ELECTRIC

CHICAGO

Makers of Over [illegible] Automatic Telephones for Use the [illegible]

If They're Good Enough for Them

OSHKOSH telephone construction tools are in constant use by hundreds of telephone companies. Repeat orders prove they are giving perfect satisfaction.

The line includes practically everything in telephone construction.

Write *now* for catalogue No. 55.

They're Good Enough for You

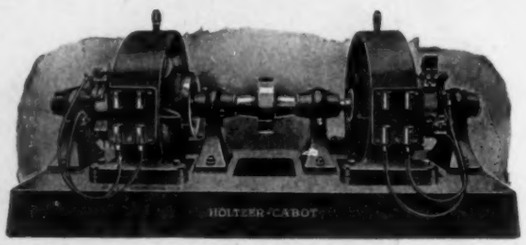
OSHKOSH MFG. CO.
Oshkosh, Wis., U. S. A.

SIMPLEX
WIRES AND CABLES

RUBBER
CAMBRIC
PAPER

SIMPLEX WIRE & CABLE Co
MANUFACTURERS
201 DEVONSHIRE ST. BOSTON
CHICAGO SAN FRANCISCO

1836



The Holtzer-Cabot Noiseless Telephone Motor Generator

It will charge your storage batteries so quietly and smoothly, that the charge may be in process while the batteries are supplying the power board.

In fact, the current it generates is of such excellence, that in emergency cases—disabled batteries for instance—the MOTOR GENERATOR CAN SUPPLY THE TALKING CIRCUITS DIRECT.

90 per cent of the Independent Telephone Exchanges have Holtzer-Cabot equipment. Have you?

THE HOLTZER-CABOT ELECTRIC CO.
BOSTON, MASS., and CHICAGO, ILL.

W & M Telegraph and Telephone Wire.
Strand and Pole Steps.

Made by
American Steel & Wire Company
Chicago New York Cleveland Pittsburgh Worcester Denver
Export Representative: U. S. Steel Products Co., New York
Pacific Coast Representative: U. S. Steel Products Co.
San Francisco Los Angeles Portland Seattle

STANDARD
Wires and Cables
Bare Copper, Brass and Bronze Wire
Standard C. C. C. Wire (Colonial Copper Clad)
Weatherproof Wire, Rubber Insulated Wire
Lead Covered Cables of all kinds

Cable Accessories
Cable Terminals Cable Junction Boxes
"Ozite" Insulating Compounds, Etc.; etc.

STANDARD products were given the *highest award in their class* at the Panama-Pacific Exposition.

Standard Underground Cable Co.
Pittsburgh, Pa.

Boston Philadelphia Chicago
New York San Francisco St. Louis
and all other principal cities

PAUL H. WOODRUFF, Editor
New York Representative: CHARLES R. CONDON
New York Office, 1022 Longacre Building
Forty-second St. and Broadway
Telephone Bryant 7030

This publication is free and independent of all business or house connections or control. No manufacturer o supply dealer, or their stockholders or representatives, have any financial interest in Telephone Engineer or any voice in its management or policy.

Entered at Chicago Post Office as Second Class Mail Matter

Telephone Engineer

WITH WHICH IS CONSOLIDATED
The Western Telephone Journal
ESTABLISHED 1902

PUBLISHED MONTHLY BY
ELECTRICITY MAGAZINE CORPORATION
MONADNOCK BUILDING, CHICAGO, ILL.
Telephone: Harrison 3014—All Departments

NOTICE TO ADVERTISERS

Changes of advertising copy should reach the office of publication not less than ten days in advance of date of issue. Regular date of issue, first day of each month. New advertisements will be accepted up to within five days of date of issue, but proof of such advertisements cannot be shown in advance of publication.

SUBSCRIPTION PRICE
Per Year $2.00
Canada $2.50
Foreign $3.00
Single copy 20

FOR SALE AT ALL NEWS STANDS

NOTICE TO SUBSCRIBERS

REMITTANCES—Remittances should be made by check, New York draft or money order, in favor of TELEPHONE ENGINEER. Foreign subscriptions may be remitted direct by International Postal Money Order.

CHANGE OF ADDRESS—The old address should be given as well as the new, and notice should be received two weeks in advance of the desired change.

If Your News Dealer Will Not Supply You—Please Notify Us

VOL. XVIII CHICAGO, JULY, 1917 NO. 1

Then it's Tommy this, and Tommy that, and "Tommy, 'ow's yer soul?"
But it's "Thin red line of 'eroes" when the drums begin to roll.

Shooting Trouble in Front of the Guns

KIPLING'S Tommy and Uncle Sam's telephone man are going through the same old transformation. The obscure, hard-working, good-natured fellow who never attends conventions and who knows nothing of commission control, accounting systems or development studies—but who does know how to connect up instruments and repair switchboards—has become the man of the minute. Chasing trouble on rural lines was only a job of work; nursing communication lines on a battlefield is a task of heroes.

No place there for a 'fraidy-cat or a sissy-boy. No place even for the safety-first lads. The grounds and opens on a military signal line are made by flying, screaming metal. And the game is to shoot the trouble shooter; to get the repairer before he can get to the repair.

The signal corps wouldn't attract good telephone men if its work wasn't dangerous. Leave the quartermaster's tent to the boys who want safety. Leave the home lines that run out of somewhere in Kansas to the fellows who can't see the use of being picked off in the act of twisting a hurried splice. Put the men in the field who know that on their thin network of wires rests the success of the army behind them.

The lad with the bayonet who goes over the top is one of those that the folks at home call heroes. And he is entitled to the name, if it means anything to him. But the signal corps boy has a little the better of him. For the telephone men of the army work, as the telephone men of industry work, alone—individually, that is. Each to his desperate or ignoble task, as the case may be, but conspicuous always; an open target for bullets and for glory and for the supreme joy of deeds that turn history.

Submarines, airplanes, giant guns are all that the people see of a war of wonders. But the army that loses its signal corps is through. The whole vast front is strung together on wires—thin, fragile telephone and telegraph wires. If they broke, and were not instantly repaired, the whole thing would fall apart like a severed string of beads, and be lost.

The men of the signal corps are the little army that makes the big army possible; that makes it an organization. Without them the voice of command would be impotent. They prepare the way for tremendous operations; any one man among them may lay the line, or make the repair, that determines the final victory.

America's telephone systems have given their good men freely to the signal corps; and when the boys return to civil life their places will be waiting for them. Perhaps our boasted service at home may fall off a bit in quality while they are absent. New telephones, and old ones, too, may have to wait a bit for installation and repair. But the army's call is imperative, and the officers cannot give their orders until the lines are laid and the switchboards set up in the dugouts. The boys are eager to come out of the obscurity of the farmers' line into the glory of the line of nations. So we must pack them off with a Godspeed and a wish that it may not be long until they are back again, ringing in o' mornings on the old clock and home for supper.

Robbing Peter to Put Paul Out of Business

INDEPENDENT telephone companies from Florida to Oregon can take considerable satisfaction in the fact that the governor of New York State vetoed the Baxter bill. They may also take warning that the same thing may happen in any state, with the possibility that all governors are not so perspicacious as Mr. Whitman.

This bill, it will be remembered, was the one that added just four short words to the public service commission law, making it allow, for rate making, "a reasonable average return upon the value of 'all' the property actually used in the public service 'within the state.'" It would have sanctioned by law a procedure that is now employed without sanction in a good many places.

This is a subject that we have discussed editorially a number of times. We always called it "permitted discrimination," because it was not stopped and because discrimination it undoubtedly is. For if it is right that we may overcharge one community that we may undercharge another, it is right to overcharge one customer that we may undercharge another.

If telephone service were in truth a monopoly, perhaps the situation would lose some of its sinister appearance. And since the Bell interests pin their faith to the monopolistic doctrine, it is natural that they see no evil in this sort of community discrimination. The New York Telephone Company, in fact, prepared a very effective argument in support of the Baxter bill, pointing out that the sparsely settled communities might have to go without service if they could have it only on condition of paying all its overhead.

But inasmuch as telephone service is not a monopoly, but is highly competitive, the innocent appearing system of averaging statewide returns becomes the quickest and surest weapon for killing a competitor. Take an example: An Independent company is operating at A, and a Bell company is operating at A, B and C. B and C have no competition, so their rates are high, and quite profitable to the company. Therefore, by averaging A, B and C, the Bell company can schedule rates at A that are away below living cost. Of course the Independent company at A, having no non-competitive points to average, is checkmated. Whether it cuts its rates to meet the situation, or leaves them away above the competitive schedule, in the ordinary course of business events, the Independent is through. That, in "A B C" language, is the evil of the statewide average plan.

The reason the Baxter bill was vetoed, of course, was that New York City objected to carrying up-state deficits. But the reason why up-state deficits threatened was that there are Independent operators in New York State who have not yet been driven out of business.

The Baxter bill in itself never was so serious as the fact that the procedure it provided for is now, and long has been, in constant use in many states. And it is a peculiarly difficult situation to combat, for several reasons.

Take our A B C example again. The Bell company at A goes before the mayor and city council and asks their support before the state commission on a schedule of lower rates. Granted, with enthusiasm and applause and the praise of the local press. The officials and people of A ask the Independent company to lower its rates also. The Independent cannot afford to lower its rates. Immediately the Bell company becomes the public benefactor, the Independent becomes the greedy, soulless corporation. The case comes before the commission, which may not understand the situation. If the commission does understand it, and refuses the lower rates, instantly it is in hot water. The public officials of A attack it, the local press of A screams at it, the man in the streets of A talks about graft. And the communities of B and C go blissfully and peacefully about their affairs, without a word of support for the efforts of the commission to save their rate schedules from going up. What do B and C care about A?

Of course, we can all tell the commission the right thing to do. It should insist upon rates that are technically correct for each community; for there is a correct rate for every condition. But if the way of the transgressor is hard, the path of the righteous is often doubly so, especially where politics is concerned.

Only when some bright genius establishes a formula that takes everything into consideration and gives with indisputable accuracy the proper rate for all possible conditions, will some of these problems be solved.

On the Rifle Range.

Scoring Hits by Telephone.

U. S. Private Using Field Telephone at Fort Meyer.

Guard at Gate of White House Communicating With White House Switchboard.

On board the Old "Granite State," Headquarters First Battalion Naval Militia.
(Above) Commander A. B. Fry, Commanding Naval Militia Guarding New York.
Some of Uncle Sam's Defenders at the Telephone—Courtesy of "The Telephone Review."

STORIES IN PICTURES OF TELEPHONE PRACTICE AND PROGRESS IN ALL PARTS OF THE WORLD.

Telephones for New York Subway

The New York Public Service Commission will approve the installation of telephones in all the stations as soon as the contract between the Interborough and Brooklyn Rapid Transit Railroad companies is completed.

Announcement to that effect was made by Le Roy T. Harkness, chief of the Rapid Transit Bureau of the commission. He had just completed the first conference with the New York Telephone Company to be held after the Interborough had placed in his hands a tentative contract stating the rates sought and other arrangements for installation of the service.

Mr. Harkness declared that every material matter had been agreed upon between the rapid transit lines and the telephone company. Upon agreement by both parties with the Public Service Commission, acting as a mutual agent, the contract was placed before the commissioners for their approval.

"It is my idea," said Mr. Harkness, "for the telephone company to start putting in the telephones the moment the contract is signed. I see no reason to wait until completion of the new subway system. If the telephones are needed at all they are needed at once.

"The telephone booths will go in every station—those of the city and the company lines. They will go in stations, perhaps, where there will be little use for them. But they will be there in case of emergency. In the subway lines constructed since we decided to put in the telephones, two years ago, there have been arrangements to sink the booths into the walls. In the other lines the booths will be put in wherever they will be of least obstruction. I see no reason to wait.

"The matter of rates I cannot discuss just now. We shall make an announcement when the negotiations are completed. I think it sufficient now to say that the tentative contract contains no important clause to which anybody objects. I think it will go through in good shape. Then the public will get the telephones."

There are public telephones in all stations on the Hudson and Manhattan Railroad. They have been there almost since the opening of the road. There never has been any question of their usefulness nor practicability.

Farmer Sues for Connection

J. U. Parsons, a farmer near Garretts Bluff, Texas, instituted suit in the Sixty-second District Court against the Southwestern Telephone Company for specific performance of contract. For cause of action the plaintiff alleges that he lives eight miles from Emberson, where the defendant has a switchboard, and that in July, 1916, he entered into a verbal contract with A. J. Sherer, an agent for the defendant, for connection for a private line, and that he put in and constructed seven miles of posts and agreed to pay the defendant $200 for the connection; but that after making purchase of the material and performing the labor of putting in the telephone poles, etc., the defendant refused to comply with its part of the contract.

The plaintiff alleges that he is a farmer and raises annually great quantities of cotton and other farm products; that he lives 22 miles from Paris, which is a general market for farm products; that prices for cotton and other farm products are quoted daily in said market, and that telephone connection with Paris as agreed between the parties is reasonably worth to the plaintiff the sum of $500 annually.

New System for Cuzco, Peru

The Empresa Telefónica de Cuzco is now giving service to about 100 subscribers, all of whom are located in the city of Cuzco, Peru. This service is available only from 6 in the morning to 9 at night and is not sufficient for the needs of the city. The apparatus now installed consists of two small switchboards having a capacity of a few more than a hundred subscribers and magneto type instruments with local batteries. All the apparatus was made by Ericsson, Sweden.

The Compañia Electrica is about to purchase this system and will remodel it throughout. In fact, it is its intention to make a complete new installation with new equipment and larger switchboard. Manufacturers interested in the possibilities thus offered are invited to correspond in Spanish, sending catalogs in the same language, with the Compañia Electrica de Cuzco, Cuzco, Peru.

The concession granted to Federico Clarke for the installation of telephone service throughout Chile has been extended to six months from May 11, 1917, for the beginning of the work and to two years from that date for the completion of the undertaking.

Summer School at Madison

The nineteenth annual stmmer session of the College of Engineering of the University of Wisconsin will be held at Madison during the six weeks' period which began June 25, 1917.

Special courses will be given in chemistry, electrical, steam and hydraulic engineering, gas engines, machine design, mechanical drawing, mechanics, shop work, and surveying. All courses given in the University summer session are open to engineering students.

Special courses have been arranged for engineering, manual arts, and vocational teachers.

Information about any of these courses may be obtained by addressing F. E. Turneaure, Dean, Madison, Wisconsin.

State Communication Committee

A new sub-committee of the Masachusetts committee on public safety, to be known as the committee on communications, has been organized. This committee will have supervision over the telephone and telegraph wires of the state and the mobilization of these respective systems, if necessary. The committee consists of Philip L. Spaulding, president of the New England Telephone and Telegraph Company, who has been appointed chairman; Charles F. Ames, superintendent of the Western Union Telegraph Company, and E. A. Kimmey, superintendent of the Postal Telegraph Company.

Central Union Appeals Order

Appeal from an order of the Illinois State Public Utilities Commission was filed in the circuit court by the Central Union Telephone Company and the Boynton Telephone Company and the Union Telephone Company. The Central Union company seeks permission to sell its Riddle Hill telephone exchange property and lines as receivers for that exchange and the Boynton Telephone Company seeks permission of the court to make the purchase. The two petitions were formerly turned down by the utilities commission.

The Function of the Signal Corps

What Telephone and Telegraph Men Should Know About Military Operations

BY LIEUTENANT W. E. PALMER

IN considering the Army from a vocational or professional standpoint, there is no more interesting part than the Signal Corps. This branch of the service may be compared very favorably, from a functional standpoint, to the nervous system of the human body. To illustrate this truth, let us take the case of a boy who inadvertently brings his finger in contact with a highly heated object. The message that the finger has been burned must be transmitted to the proper center for action. The next step is the motor message or impulse which causes the muscular movement resulting in relief from danger of further burning. Now all of this may be accomplished without the brain, or Commanding General of the body, being informed of what has taken place, as in the case of the boy being engrossed with some foreign idea, or asleep. Eventually, however, the brain will receive and register the first message. It may at that time be too late to take any action, but it is nevertheless necessary that the message go through. This truth is illustrated if we substitute for the burn the strike of a rattlesnake. In this case reflex action, while it will cause removal from the danger of a repetition, will not be able to overcome the effects of the attack, and consequently the boy would die if his brain did not act by calling in outside aid.

The action of the boy's nervous system finds a close analogy in the activity of the Signal Corps of the Army. Information gained on the field of battle, or when contact with the enemy is made, in fact all information of any value whatever, finds its way to the proper authority over the lines of the Signal Corps. In turn these lines become the channel through which orders are transmitted for the necessary action. Of course, actually the operations do not appear in as simple a form as I have given. In fact, the interchange of messages becomes quite complicated at times, but, however intricate it may be made to appear, it will be found by analysis to be governed by the general principles here laid down. Observation will disclose in the human body all of the branches and corps of an army. Thus, considering the line or combatant branches, the artillery may be likened to the ability of a man to throw missiles; the infantry to the limbs used as weapons of offense or defense; the cavalry to the legs as means of swift movement, and once on the ground as means of combat.

There is, however, no part of the Army which plays such an important part, in time of war especially, as the Signal Corps. Just as a man would be entirely useless both to himself and to others if he were devoid of a nervous system, so an Army had better disband than attempt either defensive or offensive operations without a full complement of well-drilled and efficient Signal Corps troops; and if the proper quota of trained men of this branch is not at hand, the Army would act very much like a man with a severe nervous disorder.

Thus it is seen how important the Signal Corps is to the service and some idea may be gained of the class from which must be drawn the men for its several kinds of organizations. I will give a brief explanation of the several methods of transmitting information. First, and probably of the most importance because of its simplicity, is the telegraph. This system requires for its operations telegraphers familiar with the Morse code, linesmen with knowledge of the construction of both permanent and temporary lines. Of course, it does not follow that all men in a telegraph battalion are either telegraphers or linemen. In fact, such an organization must include in its personnel cooks, auto drivers, mechanics and others. As a matter of fact, a so-called telegraph battalion is one-half telephone and one-half telegraph equipment. These organizations are employed in maintaining communication of a more permanent nature. It is more than likely that the automobile will be used as a means of transportation for telegraph battalions.

In the field battalions the organization and equipment is somewhat different from the telegraph organizations, there being three different companies in each battalion: First, a wire company; second, a radio company; and lastly, an outpost company. As may be seen from the names, the functions of each of these organizations are quite different from the others, as is also their equipment and method of transportation.

The first-named, or wire company, maintains communication between divisional or brigade headquarters, using temporary lines and the buzzer for this service. Because of the necessity for extreme mobility and great speed, these companies are furnished with the horse for transportation. A word about the buzzer will be appropriate here as completing the rough sketch of a wire company. This is in reality a telephone and telegraph instrument combined, and gives very satisfactory service for the purpose. It may be connected to lines already in operation for other systems without interference. This instrument weighs approximately six pounds and is therefore easily transported.

A radio company is just what the name implies—a wireless telegraph organization—and its duties are to keep the cavalry in touch with the division commander, and also to keep separate columns in touch on the march. With an outpost company the duties are various, and for that reason men of all capabilities are needed in forming its personnel. Its equipment consists of light field telephone switchboards, together with field telephone sets. The lines used are usually ground wires of a special manufacture.

Other methods than those given above are frequently used in transmitting information, such as the wig-wag and semaphore systems, which are used for sending messages by means of a telegraph code; the heliograph, acetylene lanterns, rockets, pistols, guns, etc. These, however, have a smaller radius of action and as a rule are subject to disadvantages which at times preclude their use. For certain purposes, however, one or more of these auxiliary methods are very well adapted.

Thus, the use of rockets or large guns as a general alarm signal is very much better than any other method by reason of the large area of territory covered and consequently the large number of men simultaneously warned. However, as different conditions are always

occurring, it is impracticable to determine in advance what method will best serve, and it is only by being prepared to use any and all means at hand, and at times to invent new methods, that the Signal Corps can most efficiently perform its duties.

As can be seen from the above, the men enlisted in the Signal Corps must be of a high standard and should be well equipped as to preliminary education along electrical lines. However, it is not absolutely essential that all men be electricians, as the corps conducts instruction in special schools and in the field, thereby fitting men not only for their special work in the Signal Corps, but, as has occurred in many cases, putting them in a position to hold very good situations in civil life. This is one of the greatest advantages of enlistment in the Signal Corps, as a man gains the best of health due to out-of-doors activity, and at the same time receives an education of great aid to him in his civil pursuit. For all of this he is well paid, his pay ranging from $30 to $81 per month, besides his clothing, rations, medical attention, etc. This pay should not be compared directly with the same amount of money earned in civil life, as it more nearly represents the cash that a man can save per month. In civil life if a man has available at the end of each month, after all expenses have been paid, a sum as low as $30 even, he is holding a very good position.

Portland Home Reorganization

The way was cleared for the reorganization and further expansion of the Home Telephone Company of Portland, Oregon, when Federal Judge Wolverton granted an application for receivership requested by Samuel Hill, formerly president of the company. The action was brought on an unpaid $50,000 promissory note dated August, 1914. Mr. Hill resigned as president and director of the company several months ago. The action is friendly and is a technical step necessary to put the company on a financially sound basis. It will have no effect upon the company's operations, and instead of hampering them will make it possible to expand business and compete more strongly in the local and long distance fields, say its officials.

Oswald West was appointed receiver by Judge Wolverton.

Receivership has been long expected. It will affect only the bondholders, however, and all current bills and expenses will be met. The company's bonded indebtedness is placed at a little less than $3,000,000. The bonds bear 5 per cent interest and are dated for maturity in 1935. This heavy interest charge sapped its strength and hampered its growth, according to those conversant with the situation.

Now under receivership, this financial burden can be readjusted, and with the company compelled to meet smaller expenses of this nature officials declare that they will be able to expand their field of operation and increase both service and income.

The physical valuation of the plant is estimated to be about $2,250,000 and its capital stock is placed at $2,700,000 in round figures.

The company has 11,000 telephones installed in the city, including 3,000 new ones which have been put in homes during the last few months. As an operating property it is considered one of the best in the country.

The next legal step probably will be the formation of a pool of bondholders of which Mr. Hill is one. They will meet, decide what they should realize on the company and then it will be sold at that figure. In this manner bondholders will be protected to the full value of the plant, but will not realize the full value of their bonds.

"This whole proceeding is simply a step in reorganization of the plant to put it in a stronger shape than ever," said J. D. Middleton, secretary and manager of the Home company. "Most of the best railroads in the country today at one time underwent the same kind of reorganization. From now on the Home telephone will be more aggressively in the field for business than it ever was. The company is growing rapidly, and we have good reason to predict that it will continue to grow."

Many of the company's bonds are held by wealthy Portlanders, a number of whom participated in the organization of the company in 1905. A large block of bonds is held in San Francisco also. The company has twice defaulted in its bond interest and reorganization has long been held as the logical means of solving its financial problems.

When to Keep Off the Line

Not long ago there was a fire in the business section of an eastern town, says Jas. H. Collins in *Everyweek*. When the fire chief arrived he saw that a second alarm must be turned in. The city fire alarm system was then found to be out of order. He sent a fireman to telephone for more apparatus.

The town, not a big one, has a fire whistle, which was blowing. When people heard the whistle they all turned to the telephone, asking central about the fire. The switchboard was a blaze of signal lights, and the swamped operators were working to answer the "curiosity calls," one by one, with half an hour's accumulation ahead of them. Somewhere among those hundreds of tiny electric lamps, lit by curiosity, was the one with a waiting fireman at the other end, and serious business—perhaps the safety of property. life, the community. How were the operators to know that his call was different? There was no way. Only by chance did one of them plug in and get the real emergency message. But for luck, he might have waited fifteen minutes.

So just bear this in mind:

When you really need central, call her.

But when somebody else needs her, and your call is backed by nothing more than curiosity—keep off the line!

A Telephone Pole Sign Post

To a telephone pole in Iowa City, Iowa, belongs the unique distinction of bearing more recognized markers if important highways than any other similar pole in the United States. The unusual pole stands in the centre of the city, in front of the most important hotel, and, of course, bears the markers because it stands squarely on the trails whose banners adorn its front, sides and rear.

Among the route markers are the Kansas City and Gulf, the Red Ball, the Black Diamond, the River-to-River Road, the M. and M., the Red Cross, the Burlington Way, and the Orange and White. High up on the pole, plainly discernible at a considerable distance, is one of the indestructible yellow and black signs of the American Automobile Association.

Charging Storage Batteries in Exchanges

Presented by Courtesy of "The Electric Journal" Pittsburgh

BY Q. A. BRACKETT*

THE change from the old-fashioned magneto-ringing to the modern common battery system of telephone operation first brought the storage battery into prominence in the telephone field, and with it the problem of keeping the battery properly charged. In a few of the larger cities direct current is available, but in the great majority of the telephone exchanges of the country the only source of power is alternating current.

As in the charging of electric vehicle batteries, two general methods of converting alternating current into direct current are available, viz., motor-generator sets and mercury rectifiers. At first motor-generator sets were used, and they still are where the sizes required are larger than it is yet feasible to build rectifiers. At an early date, however, it was found that charging a battery from a motor-generator set while the battery was in service caused objectionable noise on the telephone lines, due to the interruptions of the current and sparking at the commutator bars. Large inductance coils in the leads from the generator to the battery helped to reduce this noise, but it was still necessary to design special generators for this service with a large number of commutator bars. Even then the results were not entirely satisfactory, owing to the changing conditions at the commutator due to wear and sparking. Where motor-generator sets are still used it has become quite a frequent practice to use two separate batteries, so that they can be charged one at a time when not in service. This requires, however, considerable extra investment and maintenance expense and takes up more space. Then, too, rotating machinery with a commutator and brushes requires the supervision of an electrician more frequently than is profitable in small common battery telephone exchanges.

Fig. 1. Front and Rear Views of 30 Ampere Rectifier Outfit. For Charging Telephone Batteries. In Both Views the Apparatus Is Partly Dismantled to Show the Connections.

As a result, telephone practice has practically standardized on mercury rectifiers for charging the central-station batteries. As there are no mechanical devices causing noise to contend with, such as commutators and brushes, the problem of keeping the hum of the alternating current out of the telephone circuits can be taken care of by purely electrical means. There is nothing in the apparatus itself to make the noise any greater at one time than another and, therefore, a design that is once made adequate, as to noise suppression, will always remain so.

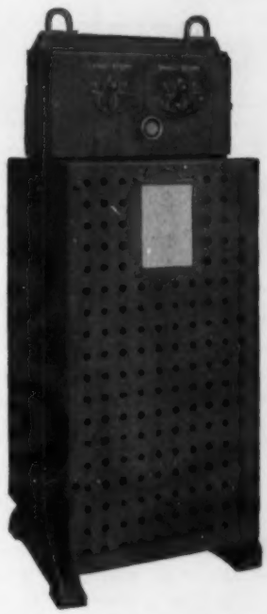


Fig. 2. 50 Ampere Telephone Outfit.

With any mercury rectifier it is necessary to provide an inductance in the direct-current circuit which will store energy during the peaks of the alternating-current wave and feed this energy out to the direct-current circuit while the alternating current is passing through zero. Such a device is necessary to prevent the arc in the rectifier bulb from going out when the current tends to fall to zero between the two half waves of the alternating current. For ordinary storage battery charging, however, it is only necessary to make this inductance large enough to prevent the direct current from falling sufficiently low between half waves to allow the the bulb to drop out, and outfits for this service may, therefore, allow a considerable "ripple," as it is called, on the direct current. Such outfits can be used for charging telephone batteries in installations where two batteries are used, and the one being charged is not connected to the telephone lines at that time.

It is the most common telephone practice at present, however, to use only one battery in a telephone central station, and to charge this battery all day while it is in use. Mercury rectifiers, therefore, have been especially designed to suit the peculiar requirements of the service, and are now very widely used. They differ from outfits of similar size for charging vehicle batteries, for instance, in three principal respects. In the first place, telephone batteries use a comparatively low number of cells, and these outfits, therefore, are designed especially for the number of cells most used in telephone service. It is also necessary that these outfits be provided with two-winding transformers,

*Engineering Department, Westinghouse Electric Manufacturing Company.

instead of the autotransformers customarily used on other rectifiers. This is to make sure that no trouble will occur on account of the neutral point of the power circuit transformer being grounded, in view of the fact that it is customary to ground one side of the telephone battery. Finally, it is necessary to provide an extra large inductance coil in the direct-current circuit of the rectifier, which will store sufficient energy to almost completely fill the intervals between the rectified half waves of the alternating current and insure an almost perfectly uniform direct current that is practically free from any ripple that might cause noise in the telephone

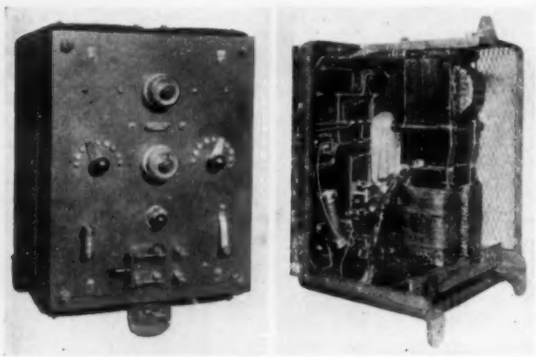


Fig. 3. Ten-Ampere Telephone Outfit.

circuits. In the ordinary types of rectifiers, the small inductance necessary can be embodied in the design of the transformer, but for telephone service it is necessary to provide a separate coil of large size.

In Figs. 1 and 2 are shown typical telephone type rectifiers of 30 and 50 ampere direct-current rating. The transformer, inductance coil, control switches, etc., are mounted on an upright, cast-iron frame, and are enclosed by ventilated metal covers, so as to form a compact single unit, well protected from mechanical injury or any likelihood of contact with live parts. Two dial switches controlling transformer taps provide the necessary means for adjusting the current to any desired value between the maximum rated value and the minimum on which the outfit will run, whether the battery is empty or fully charged, or whether the line voltage is low or high. One of these switches gives coarse and the other fine adjustment, and both are equipped with preventive resistances, so that the circuit is not broken when the switches are operated. A positive notching device makes sure that the dial switches are always left on the proper contacts, so that the resistances will not be burned out by being left permanently in the circuit. Provision is made, however, for easily replacing these resistances if it is ever necessary. These outfits are arranged for hand starting, as it is assumed that automatic starting will not be required in most central stations where attendants are always at hand.

Since these outfits are provided with two-winding transformers it is easy to arrange them for operation on either 110 or 220 volt circuits by a series or parallel arrangement of the two halves of the primary winding. Link connections are provided for this purpose and also for adjusting the outfit for charging either 11 or 17 cells, which are the batteries most commonly used in telephone work. These link connections are mounted on the back of the slate panels that carry the dial switches and are protected by metal covers. It is, of course, only necessary to get at them at the time of installation.

In Fig. 3 is shown a smaller ten-ampere outfit arranged for wall mounting and with all live parts enclosed that are at a potential higher than 30 volts. In its characteristics this outfit is the same as the larger outfits previously described, but it is intended for use in the smaller exchanges. Practically the same outfit is shown in Fig. 4, arranged like a powerboard panel for mounting on pipe supports. Outfits of this same general type can be arranged to match existing installations and have the same characteristics and utilize much of the same material as the enclosed outfits first described. These outfits can also be arranged for automatic starting when they are intended to form a part of an automatic telephone system. This automatic starting feature can be applied to any of the larger outfits, as is customary on outfits for charging electric vehicle batteries, but is not usually considered necessary in telephone service except with automatic systems.

The great advantages of rectifiers for telephone service are their low first cost and maintenance expense, their high efficiency, their smaller floor space required, and their permanent freedom from noise of all kinds. In early applications to telephone work, not all these advantages were realized, as it was customary to use ordinary vehicle battery outfits and, in conjunction with them, a separate insulating transformer and a separate inductance coil. The success of the rectifier in telephone service, however, led to the compact unit construction now adopted, which is not only more advantageous from a mechanical standpoint, but is more efficient electrically, due to the elimination of the losses in the extra apparatus.

The commercial outfits have a comparatively low power-factor, owing to the use of transformers of high alternating-current reactance in order to obtain an approximately constant-current characteristic that has been found desirable in this service. In spite of this and after taking into account the losses in the series inductance coil, the overall efficiency runs as high as 61 per cent when charging 11 cells, and 78 per cent when charging 17 cells, and does not fall off when the outfit is operated at partial load, as occurs with most other kinds of electrical apparatus.

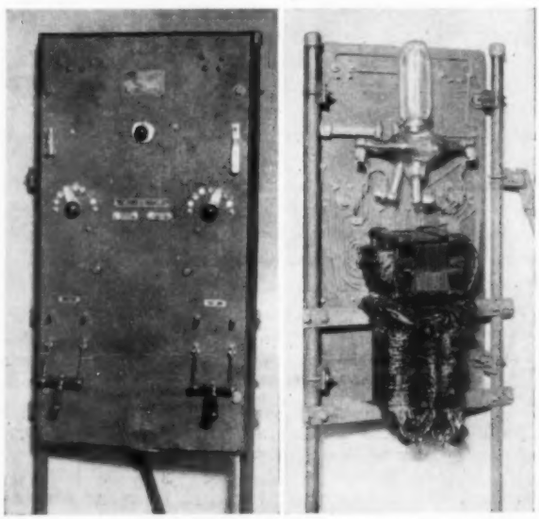


Fig. 4. Ten-Ampere Powerboard-Type Telephone Outfit.

The bulb life obtained in telephone service is much longer than in any other class of service where rectifiers are used, due to the low direct-current voltage and the large inductance in the direct-current, which gives great stability. Bulbs usually last at least a year although in service every day, and in many cases the useful life is ended only by accidental breakage. This long bulb life is partly due to the modern type of bulbs now used, which are made of special heat-resisting glass with very rugged seals, and which maintain a very high vacuum through a much longer period of use.

The use of rectifiers in telephone service is, therefore, a natural result, both of their peculiar advantages for this work and of the fact that this class of service is ideal for the rectifier, resulting in extraordinarily long bulb life and freedom from operating troubles.

One Texas Merger Off

No sooner had the city council, on June 7, refused to permit the merging of the Southwestern and Independent telephone systems in Beaumont, Texas, by declining permission to increase the monthly rate of business telephones from $4 to $5, than J. E. Farnsworth, vice-president and general manager of the Bell Telephone interests in Texas, announced that bids would be asked for the construction of the new building the company proposes to erect at a cost of between $150,000 and $200,000. The merger question is apparently settled for years to come, and Beaumont likely will continue with two telephone systems indefinitely.

But a few minutes were required to eliminate all hope of consolidating the systems. Mr. Farnsworth explained that unless the increased business rate was permitted the company could not consider the merger. Alderman E. J. Diffenbacher then made a motion that the council adhere to its former action and refuse to permit the systems to become one. Mr. Farnsworth was given permission to withdraw his application for a merger, although he first told council that in all states having public utilities commissions it would be found that the larger the company, the greater is its expense of operation.

Upon leaving the council chamber Mr. Farnsworth announced the new exchange building at Main street and Liberty avenue. The structure is to be fireproof, of reinforced concrete construction of three stories in height.

It will be the most modern telephone building in Texas, said Mr. Farnsworth, for it will have many features and improvements developed since the company erected recent buildings in other Texas cities. There will be many comforts and conveniences for the operators and other employes, one of the most praiseworthy of which will be a hospital room or ward, fitted exactly as is a ward in a modern hospital. There will be rest rooms, a cafe or restaurant, a reading room, and many other conveniences for employes, in addition to all of the most approved equipment.

All of the wires leading to the building will be under the ground.

That the company expects great growth in its business is indicated in the announcement that the initial capacity of the equipment will be adequate for caring for 5,400 telephone subscribers. There are now 3,600 subscribers in Beaumont, and it is expected that by the time the building is ready for occupancy, next May or June, there will be at least 4,000 subscribers. The building will be so arranged that it can accommodate 9,600 subscribers, which is the maximum number handled through any exchange. When the business increases beyond this figure, new exchanges, one in the northern portion of the city, to be probably known as "Magnolia," and one in the south end of Beaumont, to be designated "Park," will be erected.

Mr. Farnsworth said the new switchboards are promised for February delivery, so the building must be ready to receive them by that time. About three months will be required to install the switchboards, connect them with all wires and to construct the underground conduits. It is estimated that the exchange will be in operation within a year.

Telephone and Telegraph Committee

With regard to the utilization of the telephone and telegraph systems of the country for the government's needs, the vital thing fully realized by both federal officers and the wire companies has been to perfect a coordination to insure complete co-operation not only between the government and the companies, but between the companies themselves with regard to communications and censorship of communications. That was all arranged for some two months ago at the instance of Mr. Willard, through the instrumentality of members of this committee. Elaborate plans have been worked out already throughout the United States, all government toll calls having been given precedence over official messages; the giving of this special service requires extraordinary action on the part of the telephone officials everywhere, including the special drilling of some 12,000 long-line operators in different parts of the country. The long-distance facilities out of Washington have been increased from 148 wires to 294 wires, and plans are now being made for a still further increase. Good telephone service can be given between Washington and the headquarters of every department and naval district in the United States. Provision has been made for handling telephone calls promptly between the various department headquarters and such. Extensive methods have been devised for special telephone and telegraph wire systems for the exclusive use of the War, Navy and other deptrtments of the government. More than 10,000 miles of special systems have already been taken from commercial use and devoted exclusively to the service of the Navy, Agriculture and other executive departments. A very comprehensive system for the War Department has been evolved and will be put into service upon the call of the chief signal officer of the Army. Plans are being rapidly executed to increase the local telephone facilities of Washington; an entirely new central office with an ultimate capacity of 10,000 lines, is being installed. Provision has already been made for the construction of telephone systems in the mobilization camps. Active assistance has been given by the telephone companies to the U. S. Coast Guard officials, and plans made for providing telephone connections at approximately 100 lighthouses and 200 coast guard stations, involving the laying of some 300 miles of submarine cable, constructing more than 650 miles of pole line and stringing more than 1,200 miles of wire. Special facilities have been provided for the National Guard, particularly in connection with guarding important railroad points, bridges, and water supply systems. Even more extensive plans have been put into effect in co-operation with the Navy with brilliant success.

Look for the Difference

They laughed at Abraham Lincoln because he was so long, lean, lanky and ungainly, but later on they gave him a good deal of space in the history books. They said U. S. Grant didn't know enough to make a living, but he finally struck a job which he handled fairly well.

Napoleon was a weakling; even to his last days he turned pale and shivered with fright if a cat came into the room. Still he put across a few stunts that are yet talked about. Joseph Pulitzer was blind, and a nervous wreck, but the experts testified that he was worth $200,000 a year to his newepaper. Robert Louis Stevenson was a feeble shell of a man, but he wrote "Treasure Island" and a few other things. In my own day I have seen a pitiful, shriveled mite of a man named Alexander H. Stevens wheeled down the aisles of Congress in an invalid's chair, but when he raised his piping voice the air was full of feathers.

My friend, you have your limitations; perhaps your misfortunes. You are not as strong as Jones, nor as energetic as Smith, nor as experienced as Brown, nor as handsome as Robinson, nor as smooth as Wilkins, nor as well educated as Harrson.

Every one of them has something on you, has he? Sure—but you have something on every one of them; never forget that for a moment.

In your makeup, physical, mental or moral, somewhere in that which is called your personality, there is an element of ability, of genius, of absolute greatness.

The thing for you to do is to find it, and to develop it.

Did you ever sit down with yourself and ask this question: "In what am I different from and superior to my fellow men?". Have you ever figured out just where you have something on your neighbor, your associate and your competitor?

If you haven't, you'd better.

Nature never repeats. Every leaf on a tree is different from all the other leaves. They say the peas in a pod are alike, but the microscope shows that they differ as much as you and I.

There is something about *you* that is different from all other men. It may be a defect, but you can even make capital out of that, if you go about it in the right way. But whatever it may be, mark this: *That difference* is the one and only thing which will enable you to rise above your fellows; it is the material out of which you can make a success in life. The things in which you are *like* other men won't get you anywhere; look for the difference—it is the cornerstone upon which you must build, if you build at all.—*Sharps and Flats.*

Professor Fleming on Long-Distance

Prof. J. A. Fleming commenced his fifth lecture at the University College, London, on "Long-Distance Telephony" with a demonstration of the effect of loading upon the current sent into a 14-mile 44-lb. cable, and the current received at the far end. Artificial cables were employed, and it was shown that on switching over from an unloaded to a loaded cable, the current at the sending end diminished, but the received current very greatly increased. The high-frequency alternator used for the experiment did not yield a pure sine wave, but Prof. Fleming showed that the undesired components of the wave could be "filtered out" by connecting resonating circuits in shunt to the terminals, each such circuit containing a capacity and an inductance in series, such that the frequency with which it would resonate equaled $1/2\pi\sqrt{LC}$. By winding coils upon the inductance coils, as in a transformer, pure sinusoidal currents corresponding to the resonating harmonics could be obtained, having, for instance, frequencies of 1,000, 3,000, or 5,000 cycles per second respectively. For the study of these high-frequency waves the Duddell oscillograph was not suitable, as its natural frequency of vibration was not sufficiently great—it should be 10 times that of the wave under examination. The Braun kathode-ray oscillograph was free from this objection, but the trace obtained was not sharp enough. However, a rough practical test could be made with a condenser, voltmeter and ammeter; connecting these with the alternator, if no harmonics were present, the current I would be $= 2\pi V C \times 10^{-6}$, or $10^6 I/\pi V C = 2\pi = 6.28$; if, however, harmonics were present, the latter ratio would always be greater than 6.28, possibly two or three times as great. For a true sine wave it was best to use a special machine, such as that designed by Mr. Duddell.

The measurement of the small alternating currents employed in telephony necessitated the construction of special instruments, usually dependent upon thermal effects. Methods of measuring small capacities were also explained. Remarking, in connection with the measurement of S/C, that the Post Office engineers had discovered that gutta-percha conducted alternating currents better than direct current, Prof. Fleming described a special capacity bridge which he and his late assistant, Mr. G. B. Dyke (killed on active service), had developed for the investigation of this effect, and showed the importance of the phenomenon in the cases of dry manila paper, gutta-percha, and vulcanised rubber, all of which varied widely in conductivity for high-frequency alternating currents with the frequency and the temperature. For ordinary g.p. $S/C = 100$ or 120; for Siemens special g.p. $S/C = 20$ or 12. The value of R/L could be measured with the Hughes bridge, which the lecturer explained in detail.—*London Electrical Review.*

Business in Detroit

Five hundred girls will be needed for training as telephone operators in the Michigan State Telephone Company's school at Detroit.

They are to fill the places which will be created by the erection of new exchanges and the enlargement of old ones.

The Cherry exchange will be enlarged to thrice the size of a year ago. This will make it one of the largest central offices in the world.

The East exchange will be quartered in a new and larger building. Hickory exchange and North exchange have been doubled in size. The Market exchange is also to be enlarged.

Three new exchanges are under way. The Garfield exchange is already working in the Walnut building. The new Garfield central office will be at the corner of Grand River avenue and Chope place.

In the northeast section, at Van Dyke and Whipple avenues, the new Lincoln exchange will be erected.

Another exchange will be built on Hubbard avenue between Dix and Toledo avenues.

The biggest building enterprise contemplated by the company is, of course, the immense general office seven-story building, at Cass and State streets and Park place.

Applicants for training are all being received at the operators' school in the Cadillac building on Madison avenue. Those accepted are paid at once.

The Telephone "Doing Its Bit"

Developments of Actual War Service as Well as Preparedness at Home

BY W. N. FURTHMAN

DESPATCHES from all of the war fronts of the nations engaged in the great conflict, furnish convincing evidence that the telephone is certainly "doing its bit." While the telephone was expected by engineers to do its share, the ordinary soldier in the trenches probably had no idea what a vital part of the war the telephone would become. In open field maneuvers it has always taken a definite and prescribed place, and come be considered indispensable by signal officers everywhere.

Telephone manufacturers have made and sold large numbers of so called army field sets and have always considered this part of the telephone business profitable and desirable. Specifications, plans, circuits and photographs of this equipment and its accompaning attachments have been liberally compiled in special bulletins and as freely distributed.

Modern war, as illustrated in the great conflict has, however, brought about many further uses and opportunities for the still greater application of the telephone. Most of the old equipment has been relegated to the function of a mere accessory in the new field that has thus suddenly been brought into existence. A very few technical war experts predicted trench warfare as we now know it, but even they did not foresee that it would almost monopolize all fronts of the conflict.

Detail descriptions of trench warfare and the illustrations accompanying them show very clearly that veritable small towns are built underground. The necessity for providing all of the requirements of the soldiers, not only for winter but also for the other seasons of the year, is readily apparent. In a great many instances, especially on the western front in France, the inhabitants of villages, towns and even cities have developed almost permanent underground means of existence. A condition of this kind would make the use of a telephone indispensable with war in the immediate vicinity. Communication over any distance would be almost impossible without it.

The more recent despatches from the front have stated that it is the practice in using the telephone to revert to the old system of ground return. They also describe the elaborate switchboard systems that are installed at advantageous locations and the large number of calls and orders that are transmitted for almost every conceivable purpose. The writer was impressed with a very brief notation in one of the despatches which stated that by means of certain equipment not described the Germans were able to detect and decipher telephone messages sent over wires within 500 feet of their lines. This is possible only because the earth is used for a common return.

Other despatches have pointed out the advantages to either side of locating the telephone switchboards and by sudden dashes capturing them. In this manner it is possible to obtain valuable information by the use of acting as an operator for the enemy. It is said such an operator has so acted for hours before being finally detected.

It is clear therefore that in addition to efficiency, secrecy is a great asset in telephone war service.

It immediately occurs then that a suitable automatic system would be the most desirable. The automatic system would, of course, require a metallic circuit, but as pointed out this expense would be justified as a matter of secrecy. The automatic system would not require an operator. It would thus be impossible in capturing an automatic system to compel the attendant to answer calls of his officers. It appears to the writer that by means of an automatic system it would be possible to install only one large unit and by means of a distributing system of small units, thus minimize the loss of the capture of a position containing such a unit instead of a larger one. In this manner the war system in the trenches would be similar to the well known plan of distribution followed in installing an automatic system in any of our large cities. It would also seem possible from an engineering standpoint to so design the switching apparatus that an attempt to listen in would be as futile as the attempt to destroy the secrecy of the present automatic system used for commercial or private purposes. It would seem clear, therefore, that for a good many reasons the telephone system for war should be an automatic one.

The progress of the war has also shown the necessity of properly equipping coast defenses not only with wireless systems, but also with the most complete telephone systems. While the problems in coast guard systems cannot be said to be the same as those involved in trench warfare, there is ground for the belief that in a general way they are very similar. A sudden attack of a landing party at a strategic point near a coast defense would be likely to result in trench warfare. Modern war has surely demonstrated that other fortifications will not withstand the heavy explosives used in modern mortar guns.

In coast defenses comparatively great distances are involved, which is not necessarily true of trench warfare, although on the Russian frontier thousands of miles of trench systems are extended over the entire front. In coast defense warfare it would seem necessary because of the long distances involved, especially in the United States, to install loading coils in the telephone circuits. The patents on this apparatus expire this month and it should be possible for the government not only to obtain this equipment for itself, but also for its allies.

It is supposed as a matter of good engineering practice that the government is telegraphing over its telephone lines. It is only in this manner that the greatest possible

capacity can be obtained over a coast defense telephone system. The installation of loading coils would in no way prevent this advantageous condition, but would as a matter of fact tend to promote it.

While the great war has not been brought to our shores as yet there is some danger that it might and as a matter of preparedness the use of the telephone should be brought to its utmost power for service of war.

It is realized that as far as the war is concerned it has actually reached our shores as a matter of industrial preparedness. Only recently the associated press tells us that the officials of the Bell companies say we must not complain of delays in obtaining toll and local telephone facilities. The Bell people further state this is due to the large requirements of the Government for preparedness causes.

It is a well known engineering fact that it is possible to telegraph over a telephone wire and vice versa. Provided the United States Government were to require the Western Union and Postal Telegraph companies so to arrange their lines (and it would be a small thing for the telegraph companies to bring about) it will be clear that the government would have at least treble the facilities now at its disposal.

It seems to be the plan of the Bell companies, however, to prevent such an arrangement rather than assist it. The Bell, Western Union and Postal Telegraph companies have been before the Interstate Commerce Commission in connection with this plan of serving the public since the year 1915. No decision, however, has been reached by that body. In Illinois the Chicago Telephone Company has taken the interest of the public to heart and filed a complaint that the Postal company has no right to operate as a telephone company in the state. The Utility Commission, after a year's delay, decided in favor of the former company. So we have Illinois, at least, failing to co-operate with the government as far as additional telephone facilities are concerned.

Under the Post Roads act of 1865 Congress granted free right of way to telegraph companies as a war measure. The Postal company claims that in telephoning over such a telegraph line it is within its rights, and the writer believes that as a war measure it is certainly entitled to operate. The trouble seems to be that the A. T. & T. Co. endeavored to have Congress, in 1879, interpret the Post Roads act of 1865 to include telephone companies. The courts and Congress have consistently refused to concede that interpretation, contending that it was impossible for anyone to have foreseen the advent of the telephone in 1865. Be that as it may, the A. T. & T. Co. is telegraphing over a telephone line and vice versa.

Since 1891 the A. T. & T. Co. has been so operating in Chicago without a franchise or authority of any kind whatsoever. In 1913 the company admitted it. In April, 1917, it was again accused of it by the city authorities. It will no doubt deny the charge.

The service the company renders is to stock brokers, board of trade firms, press associations, news bureaus, etc., and the revenue so obtained throughout the country amounts to about 25 per cent of the total Bell Telephone Company's revenue.

So it will be clear why the Chicago Telephone Company has fought the Postal company in Illinois. As a matter of rates it can be noted here as a matter of further information that the Postal company's rates for toll service in Illinois are less for five minutes than the Bell's rates for three minutes to all comparative locations from Chicago.

It would seem clear that as a war measure the authorities everywhere should awaken to the importance of a situation that has been sadly neglected in times of peace.

To Locate Moisture in Cable

Since the following method of locating cable trouble has been very useful to me, I will try to explain how it is used and when it can be used to advantage, says C. W. Lowther, wire chief at Pittsburg, Kansas, in the *Southwestern Telephone News*.

No doubt all cablemen and wire chiefs have located moisture cable trouble in one, two, or three spans of cable, but cannot find the exact spot, or have a wet sleeve, but do not know which one of two or more sleeves it is. It sometimes happens after boiling out a large cable that has been wet, a few pairs still show bad. I have found the following method very useful in the above cases. This method can be used when the trouble is too light to use the telephault; however, it is of no use in a long stretch of cable, as it takes too much time.

Select two to five pairs that show moisture, bunch them and connect a receiver and about ten cells of battery in series to ground or cable armor. This can be done in the central office, at a terminal, or opening in the cable. Then place the receiver to your ear, and have a man ride the cable and strike it about every 12 inches with a well-padded lead dresser, so as not to damage the cable. The wet cable pairs make a frying noise in the receiver, but when the wet place is hit, the resistance of the moisture trouble is changed and sounds similar to hitting a transmitter.

This method can be used no difference how light the trouble shows, which is not the case with the telephault. This method is also very useful in determining which cantail is wet when several of them multiple, and can generally be determined by using one cable pair with the main frame clips for testing cable pairs, and listening at the wire chief's desk with the battery key up. You should be in communication with the man doing the pounding all the time; if he is riding the cable a third man should be placed at a terminal so he can call to the man doing the pounding and tell him when he has hit the wet spot. After you have heard the pounding noise you can have him pound several feet along the cable and determine the place where you get the pounding noise the strongest, which is the wettest place.

With this method a case of trouble at Pittsburg, Kansas, was located and cleared in a 50-pair cable after dark, which had been ridden over in the daylight, the crack being too small to be seen.

Telephony in Argentina

The *Review of the River Plate* says the Government of Cordoba have forwarded to the President of the Local Board of the United River Plate Telephone Company (Dr. L. M. Drago) a petition signed by a large number of agriculturalists, stock farmers, traders, industrialists and other residents of Jesus Maria, asking for the construction of a telephone line between that town and the City of Cordoba.

Telephone Transmission

From the Sibley Journal of Engineering, Cornell University

BY BANCROFT GHERARDI

Bancroft Gherardi, Engineer of Plant, American Telephone and Telegraph Company.

THE purpose of a telephone system is to enable people to communicate with each other by spoken words when located at a distance from each other. The only practicable means now known of accomplishing this is by electricity. Problems concerning telephone transmission, except some of those pertaining to the transmitter and the receiver, are, therefore, problems relating to the transmission of electrical energy. Broadly speaking, these problems bear a general resemblance to the problems pertaining to alternating current power transmission, but both qualitatively and quantitatively there are many important differences. The electric current which carries a telephone message is an alternating current consisting of many different frequencies and varying in a most complex manner. To successfully transmit this current we must accomplish the following results: It must be transmitted with a reasonable degree of efficiency so that the amount of received energy will be sufficient to satisfactorily operate the telephone receiver. It must be transmitted not only with efficiency as a whole, but each of its component parts, which may be of frequencies from about 200 periods a second to over 2,000 periods a second, must be transmitted with a sufficiently uniform degree of efficiency so that the character of the wave will not be unduly distorted. In addition the wave must be protected from electrical disturbances induced into the circuits from outside sources. These results must be attained not only with reference to the line wires and the apparatus directly associated with them but also with reference to the switchboards necessary for interconnection, the signaling apparatus necessary to control the use of the circuits and the protective apparatus necessary to safeguard the users of the circuits and the circuits themselves and their associated apparatus against excessive electrical currents or potentials.

LONG OPEN WIRE CIRCUITS

In order to illustrate the nature of some of these problems I will first consider a comparatively long toll line in which many of them arise in an acute form.

A New York-San Francisco circuit, or rather the circuits which combined together constitute a New York-San Francisco circuit are representative of many telephone circuits which together form a network connecting the principal centers in the United States. The distance from New York to San Francisco is 3,400 miles. The circuit in question consists of two wires each weighing 435 pounds to the mile or a total of about 3,000,000 pounds of copper. A circuit such as this for the telephone current having an average frequency of 800 p.p.s. would deliver at the receiving end one fifty billionth of the energy put in it at the transmitting end. Certain limitations on the power of telephone transmitters and the sensitiveness of telephone receivers which will be referred to later establish the fact that it is not reasonable to expect good transmission on a line which does not deliver to the telephone receiver at least one thousandth of the energy sent out by the transmitter and in many cases one one-hundredth or more is desirable.

LOADING

These facts are sufficient to show that the long distance telephone problem is largely a line problem. One step in improving the efficiency of a long line is to add to it at suitably determined intervals specially designed inductance coils known as loading coils. On the New York-San Francisco line there are about 400 such coils spaced at intervals of about eight miles. These coils diminish the losses in the circuit to such an extent that it will deliver at the receiving end about one millionth of the energy put in the circuit at the transmitting end. This proportion of received energy is still far below that needed for commercial service.

A step has, however, been accomplished in the right direction, but only by the most careful design and manufacture and spacing of the loading coils. Because these loading coils occur successively in the line any losses in them are cumulative and as every inductance coil must have losses both in its conductor and in its core these must be carefully studied. An apparently insignificant loss of only one per cent of the energy in each loading coil would mean that the received energy would be less than two per cent of what it would have been had there been no losses in the coils. Actually on this circuit, the loss in the coils reduces the received energy to about one-quarter of what it would have been had the coils been without energy losses. Practically these coils are as good as it is proper to make them with the existing state of the art and considering the economics of the problem.

REPEATERS

Further improvements have been made by associating with this line intermediate apparatus known as telephone repeaters and capable of receiving an enfeebled electric current and putting into the line a new electric current derived from a separate source of energy and controlled by the enfeebled received electric current, so that the new current possesses the same characteristics in regard to shape but is greatly magnified. The use of such apparatus required a comprehensive study of amplifiers, methods of connecting them into the circuit and of line characteristics, and many rearrangements in the existing lines so as to adapt them to the new methods of working. Thus it is possible to receive at the distant end of the circuit energy equal to one eightieth of that placed upon

the circuit at the transmitting end and thereby give good commercial service.

OTHER IMPORTANT FACTORS

There are many other problems in connection with this line which cannot be touched upon within the limits of a paper such as this, but a few may be mentioned. This line is equipped with about 300,000 insulators. Loss of energy must be guarded against at each of these points. For various reasons it is necessary to insert in this line a number of transformers, or, as they are usually called by telephone men, repeating coils. To properly handle the high frequency telephone currents and to make from time to time the necessary changes in impedance, that is the ratio of voltage to current, the telephone transformer problem has been carefully worked out so that there are available for use suitable transformers of high efficiency. To meet the practicable operating conditions and to enable the line to be used, not only at its terminals, but from intermediate points, the line is switched at a number of points where it passes through telephone switchboards. At each of these points the switchboard apparatus must be designed with the utmost care to reduce the losses to a minimum. At numerous other points the line must be made available for testing and similar conditions must be met.

LONG CABLE CIRCUITS

Under many conditions it is necessary to place telephone lines in cable. Since this brings the two wires constituting a circuit close to each other and requires that some dielectric other than air be used for maintaining the separation of the wires, the transmission losses are much greater than in the open wire circuits. Further limitations result from the fact that as a cable of the type usually employed must be incased in a lead sheath and either supported by a strand or placed in an underground duct, there are sharper economic limits to the sizes of wire that may be employed. At the present time there is working in the plant of the Bell telephone system a cable almost 500 miles long extending between Boston and Washington and connecting these places together and with New York and Philadelphia and other important places. The largest size of wire employed in this cable is a No. 10 B. & S. gauge and with this the following results are obtained: Without loading one thirty-thousand billionth of the energy at the sending end is received. By suitable loading the efficiency of the circuit is increased so that one three-hundredth of the energy is received. By the addition of suitably connected amplifiers or repeaters the efficiency of this circuit 500 miles long is rendered such that one-tenth of the transmitted energy is received or a very high grade of telephone transmission is given. These results are obtained, however, only by most careful and scientific attention to the design of the cable itself, the design of the loading coils, the design of the repeaters and associated apparatus, and all of the switchboard and other apparatus connected to the circuit.

In connection with such circuits as these it is interesting to note that they are relatively long in comparison with the electrical waves which they carry. On this circuit of which we have now been speaking the wave length for 800 frequency is about thirteen miles. On such a circuit we are dealing with a decided case of wave propagation, the receiving apparatus being electrically so far distant from the transmitting apparatus that it exercises no perceptible reaction on it. This is likewise true of long open wire circuits.

PHANTOMS

Many long telephone circuits are arranged for what is known as phantom circuit working, by which out of two ordinary metallic circuits a third one may be obtained by using the two wires of one circuit in parallel as one side of the phantom circuit and the two wires of the other circuit in parallel as the other side of the phantom circuit. To accomplish this result it is necessary to make arrangements at the terminals so as to connect in at exactly the middle point electrically of each of the two circuits. This is usually done by means of carefully balanced transformers, the phantom circuit connection being made at the middle point of one winding. It is also necessary to carefully arrange the wires of the circuits with reference to each other so that there is no crosstalk either between the side circuits or between either side circuit and the derived phantom circuit. The balancing problems in connection with such arrangements are complex and have received long study.

TELEGRAPH COMPOSITES

In addition, in many cases each wire is used as a grounded circuit for telegraphy. This necessitates the use of carefully designed apparatus usually consisting of condensers and impedance coils so arranged as to separate the telephone current and the lower frequency telegraph current from each other. This must be done so perfectly that neither service will be interfered with either by the presence of the other or by the losses brought in by the separating apparatus.

Since the telephone receiver is so sensitive, it is necessary that arrangements shall be made so that there will not be induced upon the telephone circuit even minute currents from outside sources. Such disturbances are of two general classes:

CROSSTALK

The first is that which may arise from the induction between one telephone circuit and another. Practical considerations make it necessary to place a number of open wire circuits on the same pole line, and in cables circuits are necessarily brought in very close proximity to each other. There may be as many as 40 or 50 open wire circuits on the same pole line, and often as many as 1,200 pairs of wire are placed in a single underground cable. This induction between telephone circuits is commonly called cross-talk.

So sensitive is the telephone, that if there is transmitted from one circuit to another more than one millionth of the energy of the telephone current in the transmitting circuit, it is likely to produce objectionable crosstalk. To avoid this it has been necessary not only to arrange most carefully the telephone circuits themselves so that they will be balanced, but to consider rigorously the design and method of connection of each piece of apparatus associated with the talking circuit. Every loading coil, transformer, relay and condenser must be considered, not only with due regard to its effect on the balance of the circuit, but also with reference to the possibility of its directly inducing disturbances in adjacent apparatus.

NOISE

A second class of disturbances that must be guarded against is that arising from electrical circuits rendering other services, of which electric light and power circuits are typical. These circuits carry currents vastly more powerful than the telephone current, and are surrounded by electrostatic and electromagnetic fields which may, if suitable precautions are not taken, disturb telephone circuits at distances of hundreds and even thousands of feet. The problem of protecting the telephone circuits,

particularly open wire circuits, from such disturbances is one of the greatest magnitude. In many cases it cannot be met merely in the design and arrangement of the telephone circuits. It requires co-operation on the part of the electric light and power people to balance their systems as far as practicable, and to so design their generators, motors and other apparatus as to avoid the presence in them of frequencies that seriously interfere with telephone service. This has required much work, not only on the part of the telephone engineers, but by the electric light and power engineers. It is interesting to note in this connection, that in general it is not the fundamental frequency of the power system which causes the trouble in the telephone circuits, but it is the higher harmonics which are of no value to power people as part of the operation of their systems, but which are there because considering the power problem in isolation there has not appeared to have been sufficient incentive to remove them.

SUBSTATION SETS AND LOCAL PLANT

So far I have spoken of telephone transmission in particular relation to the long distance lines. Important and difficult transmission and economic problems occur in the local plants, which include the local subscribers' lines and the telephone instruments themselves, the trunk line between the various offices in all large cities and the short haul or suburban toll lines. Limitations of space prevent more than a reference to these problems, although they are as interesting, and at least as important as those occurring in the long lines, and must be worked out with due regard to the ability to connect together at any time all of the elements of the system needed to enable any two subscribers wherever located to communicate with each other.

The substation sets, including the transmitter and the receiver, are most important elements of the system. At first view, this apparatus seems simple. The transmitter which converts the speech vibrations of the air into the telephone current consists essentially of a diaphragm controlling a group of microphonic contacts. The receiver which converts the received telephone current into air vibrations consists of an electro-magnet acting on a diaphragm. Considering the millions of these instruments required and the essential functions which they perform, their design evidently justifies the most elaborate and persistent investigation and development work. They have been and are being so treated, and although apparently simple, there are to be found in them complex mechanical, thermal and electrical problems which combine somewhat the problems of measuring instruments, generator and motor design as well as other problems peculiar to themselves. There is also required consideration of the nature of speech vibrations, their essential characteristics and the relative importance of the various component vibrations going to make up the complete complex wave forms.

The fundamental design of transmitters and receivers cannot be considered in isolation. Such work must be considered in its relation to the lines and other apparatus, with which the instruments are to be used. Many inventors and scientists in this country and Europe have taken the view that the way to solve the problem of telephony through cables and over long open wire lines was to increase indefinitely the power of the transmitter, losing sight of the fact that such a solution would not only require the use of special and complex apparatus at each subscriber's station but would so increase the crosstalk on telephone circuits as to require the complete reconstruction of existing telephone plants and the construction of additions on a much more expensive and difficult basis, perhaps even on one that could not be successfully maintained in practice. Engineering investigations made on a correct basis, taking into account all of the factors of the case, have shown us that a great increase in the power of the transmitter is not the way to solve these problems, and we have attacked them along other lines, the nature of which has been briefly indicated.

An indefinite increase in the sensitiveness of the receiver would similarly involve difficulties, among which may be mentioned the increased effect of disturbances from outside circuits and from crosstalk.

Every American familiar with the facts must view with satisfaction what has already been accomplished in this country in the development of the telephone and telephony. The American telephone system today, consisting as it does of about ten million telephone stations and twenty-five million miles of telephone wire connecting these stations together, is recognized as the model telephone system of the world. Due to this development there are in the United States today more telephones and more telephone plants than are to be found in all the rest of the world. Telephony is truly an American art both in its development and in the extent of its application, but as great as these developments have been the engineers of the Bell system do not feel that their work is done, but on the contrary they look forward confidently to advances and developments in the future that will be even greater than those which have been made in the past.

Indiana Interconnections

The systems of the Whitley County Telephone Company and the Farmers' Mutual Telephone Company of Indiana must be connected unless the latter company sees fit to apply for a rehearing before the state supreme court. That judicial body handed down a decision affirming the decision made last fall by Judge Wrigley, of the Whitley circuit court, in which he upheld the decision of the public service commission ordering the two companies to be connected. This last step is one of several in a legal tangle, occupying the time from 1915 until the present. The action was started by the Whitley County Telephone Company, which asked for an order from the public service commission for physical connection with the other company. Judge McClure tried the case as a member of the commission and rendered the verdict that the companies should connect. The Farmers' Mutual Company took an appeal to the circuit court, asking that the order of the commission be set aside. Judge Wrigley took the evidence and confirmed the commission's order. Meantime other evidence had been submitted to the commission, which subsequently rendered a second order, much the same as the first. An appeal from this order was taken to the Whitley circuit court, and has been pending for want of a judge to handle the case. It will have little bearing on the present situation. The order for connection went into effect in the spring of 1916, and it is said to be specified in law that a heavy daily penalty will be inflicted upon the company refusing to make the connection. The Whitley County Telephone Company served notice at the time of the order that it was ready to connect up at once.

Operators in Russian Revolution

In the Petrograd, Russia, telephone exchange recently, the girl operators made a secret arrangement to deprive the radical leader, Nikola Lenine, of telephone service for his paper, the *Pravda*. For three days they took no notice of calls for or from the paper and then they curtly replied, "Hang up. We aren't working for Lenineists."

Three Lenineists arrived at the exchange several days later and declared that the telephone did not work. Manager Sempovitch, surprised, searched the files for orders, but found none requiring that the Kshesinske house, which is the Lenineists' headquarters, be isolated. He asked the delegates to accompany him to the operating room to question the girls.

Immediately the operators learned the identity of the visitors they whirled around in their seats, a clamor arose and shouts were heard, "Down with Lenine and his rioters! Throw them out! Get out, you dirty scamps!"

The delegates, somewhat awed, asserted that Lenine foresaw the possibility of bloodshed in the street rows between his followers and loyal Russians and that he could not avert it if he were not allowed to telephone. The girls replied that he was to blame for inciting people to bloodshed, and some of them added:

"Why don't you do an honest day's work and earn a few pennies to use in the telephone booth when you want to stop your thugs? Now clear out before we put you out."

Amid a storm of hissing from the operators the delegates hurriedly withdrew. In a towering rage they threatened the manager that they would send armed Lenineists to seize the exchange. Sempovitch reported the threat to the military authorities, who sent an officer and fifty soldiers to wait behind the exchange door in readiness to demolish the Lenineists should any appear.

Meanwhile threats, prayers, entreaties and ethical reminders of their duty slipped off the operators like water from a duck's back. They flatly refused to heed the Lenineists' telephones and so arrangements were made for a man operator to sit in a private room of the exchange and attend to Lenine's conversations.

Inductive Interference

Since the publication of its preliminary report to the California State Railroad Commission, dated July 7, 1914, embodying recommendations for rules which were adopted by the commission and constitute General Order No. 39, the Joint Committee on Inductive Interference of the State of California has carried out a large amount of additional experimental work and computations and is at present engaged in drafting recommendations for the revision of the rules now in force.

The experimental work has been directed mainly to determine whether or not it is possible to avoid similar experimental work in all the various cases that arise. For example, the induction in the parallels that have been available for experimentation has been computed from the known physical constants of the circuits with no reference to the results derived experimentally, and has been compared with such experimental results to determine whether the amount of induction can be computed with reasonable certainty without tests. The results of this comparison show that the relative amount of induction from untransposed parallels of different lengths, separations, configurations, balance, wave shape, etc., can be computed from the dimensions of the circuits without experimental test with an accuracy comparable with that of the assumptions which usually have to be made as to the amounts of load, balance, wave shape, etc. Such computations have been made for all of the several kinds of induction, electric and magnetic, due to either balanced or residual voltages or currents, over the complete practical range of separation and power circuit configurations, including a large number of cases of twin circuits. This involved an enormous amount of work, the results of which appear in more than 3,000 curves on 212 curve sheets.

A large amount of work has been done on the effect of extraneous currents on telephone conversation at the request of the committee by the American Telephone & Telegraph Company, resulting in the design of a new telephone transposition system especially adapted to power line exposures.

Based on the computations above outlined, certain configurations of power lines, both single and double circuit, and certain interconnections of twin circuit lines have been found to be preferable. It appears desirable to require transpositions for the purpose of balancing the capacitance of lines to ground and some other precautionary measures are recommended on all future construction, with certain exceptions, instead of only on lines involved in parallels. This is for the reason that such lines may later become involved in parallels, at which time it is much more difficult and expensive to install transpositions or make other alterations than when the line is under construction.

On account of the demand for a specific definition of what constitutes a parallel with a telephone or telegraph line, the committee is setting forth the factors to be considered and is presenting such information as is possible on the length of exposure that may require power line transpositions to reduce induction, this information being given for the practical range of separation between lines, power line voltages, various power line configurations, and with assumptions as to wave shape, shielding, telephone line unbalances, effect of other exposures, etc.

The necessity has arisen for a basis of division of costs for avoiding or mitigating interference in cases of parallels proposed or created hereafter. Accordingly the committee is giving consideration to this phase of the problem and expects to present a basis which will be applicable to the general case.

Indiana Women Don't Gossip

The Colorado Public Utilities Company at Denver has been asked to prevent women in southern Colorado from monopolizing rural telephone lines with neighborhood gossip. One man, testifying before the commission in the investigation of rates and service, declared that farmers were unable to transact business over the telephone because of this gossip and requested the state commission to remedy existing conditions.

About this state of affairs the Evansvills Ind., Courier says:

"We believe we can say better things about the women along rural telephone lines in southern Indiana. Here the telephone performs a real service. A news item published in the Courier a few weeks ago quoted a rural telephone operator with saying that 85 per cent of the calls through the central station under his charge were business calls. We think this a very pretty compliment and believe rural telephone subscribers in other localities are just as deserving."

Where We Are Drifting

Address Delivered at Southern States Independent Telephone Convention at Louisville, May 24

BY TERRY W. ALLEN

THE other day I was seated upon the bank of a stream and was watching the current as it flowed majestically by. There was a lot of driftwood in the current, for the water was above its usual height—and driftwood is always an indication of high water. The water was muddy, not clear as it is under usual conditions, and in the shimmering sunlight it appeared like a vast yellow serpent as it wound in and out in its tortuous course.

I watched the bits of wood as they came into sight around the bend; some of them twisted, turned and lodged upon the banks while those of a heavier nature floated sedately down the middle of the stream until they were lost to view around another bend. They were drifting with the current that would carry them somewhere; that was all that they could do. They had no power to stem the tide that was forcing them onward, nor to check the force that carried them along.

Today humanity is drifting; drifting along in a very similar way to the bits of wood in the current of the stream. And where we are going, where we are bound, where we are headed is a difficult and perplexing problem to answer.

A good many years ago I stood in the old Forum at Rome. Most of its grandeur was destroyed and only a few pillars here and there showed the signs of what had been an advanced age in civilization hundreds of years ago. Off to one side of the Forum, about twelve or fifteen feet up in the air, was a small modern house resting upon an ancient temple; for a long time ago the Forum had been completely obliterated and earth, dirt and rubbish had covered it, and on the top of this rubbish this little modern house had been built. In other words, a leveling period in history had come about, or a period that had destroyed the civilization that existed in order to make room for another civilization to take its place.

I never thought that I would have the privilege of seeing one of these leveling periods come about, but during the great war which is now in progress that same process is going on and the civilization of centuries is being obliterated on account of military necessity and to the leveling effect of the great guns that are roaring in Europe. Today is a leveling period in the world's history. Treasures of art that have stood the call of time for hundreds of years are being obliterated by a single shell; and we have drifted into that maelstrom.

This country of ours has come to, faced, and met a crisis. Through the sagacious leadership of the President of the United States we have determined to enter and do our part toward stabilizing civilization; we have decided to take the step which has plunged this nation into another war.

War reminds one very much of a nightmare, and when we think of the colossal struggle that is permeating the field of Europe we are forced to take an inventory of our own industry in order that we may be best fitted and best equipped to do our share in the struggle.

The German nation has defied the world, and organizing itself with a number of allies in Central Europe, it has set out either to rule or ruin; and the United States has become a part of the force appointed to try and check the advance of German kultur, which was destined, if let alone, to be the controlling factor in the world's commerce.

In the stupendousness of the historical setting of today it is almost impossible to realize thoroughly the position in which we find ourselves. The United States, a free democracy, is called upon to sustain the older and more stable European nations in a fight for world liberty and against the power of militarism, as expressed by the German nation. The United States has never been a military power. Its general scope and trend has been a volunteer nation in military affairs. The constitution protects this country against the excessive growth of military power; and we today find ourselves compelled by necessity to throw aside the volunteer principle and resort to the ancient form of conscription for military service, and this is exactly the right thing to do. A democracy, such as we are, cannot at this time temporize, nor should we, its citizens, allow it to temporize in matters pertaining to the great war, for the current we are in is swift, is boiling with an onrush of events that, if we do not heed, will likely engulf, enslave and destroy every vestige of freedom upon which the American government has been built.

The current, as I have said before, is swift, and will either land us upon the rocks of indifference or in some whirlpool of inactivity, or will sweep us out into the broad channel of intelligence and constructive world building and make us the foremost, the most dependable republic that the world has ever seen.

President Wilson has mapped us out a course to pursue and all business men should subscribe to it, no matter what their political views may be. If they understand the problem justly, they will be behind the President in the course that he has taken, for it is the only course that an intelligent nation can pursue, if the integrity of a republican form of government is to be preserved upon the face of the earth. Mr. Wilson did his utmost to keep this country clear from any kind of entangling alliance with any foreign nation. He tried to the best of his ability to keep the United States in a state of peace despite the fact that his critics called him everything from a weakling to a coward. President Wilson did his best to keep this country free from war, and he did not plunge us recklessly into the maelstrom that now threatens most of the civilized world. Mr. Wilson came to his decision not hurriedly, not quickly, not unthinkingly, but after due deliberation, after conscientious thought and study of the problem that besets the world.

The German nation did everything it could to cast discredit upon his administration. This may be likewise said of the English nation. Both sides claimed that Mr. Wilson openly and maliciously favored the opposite side. The English press and the German press were most caustic in their criticism of the President and his acts. The German influenced press in this country and the English influenced press accused the President of everything that was possible to accuse him of to prove his unneutrality to their side of the question. Germany claimed that the United States was knowingly and willingly helping to starve the German nation and was

furnishing the means of carrying on the war to England and her allies. England claimed that the United States was feeding the Germans through European nations, and openly violated every vestige of international law in order to prevent our mails and our shipping from reaching its intended destination. To my mind, the rights of international law are based not on justice and right but on the caliber of the guns of the nations desirous of determining the legal status of a given question.

So far as the two leading nations in the World War were concerned, both of them were antagonistic to Mr. Wilson and his administration and did everything they could to hinder, by their hirelings who ran newspapers with subsidies furnished by foreign governments in our very midst.

Mr. Wilson thought he had settled the German submarine policy when the Lusitania was sunk; and he made the statement that we would not as a free and democratic nation tolerate this form of barbarism, which could only be conceived in a moment of weakness by the barbarous and inhuman ruling forces of Germany.

Germany believed Mr. Wilson was bluffing; and it made so bold as to launch another attack by the U-boats in defiance of the President's warning. The United States, the greatest of the neutral nations, was forced to renounce her policy. Now we must do our share, cost what it may, in order to help bring Germany to a realization that the world will not tolerate barbarism, regardless of who fathers or fosters it.

Upon the conclusion of this war the position of the United States as a world power will be recognized according to the strength, ability and intelligence that we display in the fight we now have to make.

Bringing this question down to the present time, and looking at the industrial situation in this country and the drift of political economy as relates to the internal development, we must see that this country since the Civil War has developed into a country of big business. We must remember that the early population of this country was a mixture of cavaliers, Puritans and religious exiles, and amongst all of the colonies that settled upon the Atlantic Coast and along the Gulf of Mexico were criminals of the first water that had been sent here in order to rid the foreign countries of this class and type; and these criminals and their descendants are still a part of the population of the United States. They have ceased their petty criminality because the advantages and resources of the country have given them the power and the ability to grasp large opportunities rather than small, petty opportunities.

It can be clearly and truthfully stated that in every war this unpatriotic and seditious mob have always taken advantage of the conditions that war usually brings about. They took advantage of this condition in the Revolutionary war, in the War of 1812, in the Mexican war and in the war between the States. They stood up again with equal zealousness in the Spanish-American war, and you can watch—they will come to the surface in this present war. This unpatriotic citizenship will take every advantage they can of every opportunity that is offered to get into their hands by unfair means all of the business of the country. They are not the ones who will go to the front, although, thank goodness, conscription will get some of them that otherwise would escape; and it is against this unpatriotic citizenship that we must of necessity guard. For this group of people will bind themselves together whenever the opportunity occurs and, like vampires, will suck the blood out of American industry to enrich their own pocketbooks, in order that they may practice their thievery and chicanery unmolested while the valor of American manhood is trying to crush a foreign foe.

I will not name these low, detestable, cowardly citizens, although I have a good idea of just who and where they are. I know what they did to the South right after the Civil War, and I know what they did to our own troops during the Spanish-American war, and I know what they will do again during this present war if they get a chance.

Consequently, I want to utter this word of warning and to make this suggestion; for it is just as likely to occur in the telephone business as any other form of business enterprise of the country. Some of us are going to the front. Some of us are going to leave our businesses because we believe we can be of service to the country. Those who stay at home we wish to protect our rights, our privileges, our endeavors, and when we come back (if we do come back—and there is a serious doubt in my mind as to how many of us will come back) I hope that those who do stay will protect the telephone industry from the vampires that would like to use these means and methods while the country is engaged in a death-struggle to enrich themselves at our expense.

New York Rate Equalizer Vetoed

Governor Whitman has vetoed the Baxter bill, designed to equalize the rates for telephone and telegraph service throughout the state of New York. The governor held that as the federal constitution protected a corporation to the extent that rates could not be so reduced as to fail to make a reasonable return on the value of the corporation's property, the legislature should leave the question of rates to the decision of the Public Service Commission.

It was disclosed as a consequence of the questioning by Governor Whitman at a hearing, that the secret purpose of the bill was to prevent any reduction in telephone rates in New York city. Attorneys for the telephone company admitted they anticipated such a fight in 1918, when their present rate agreement with the Public Service Commission expires.

The bill provided that in any application to fix rates the value of all the telephone company's property within the state must be taken into consideration.

Such a scheme would permit the telephone company to honeycomb the Adirondacks with unprofitable telephone lines and charge the loss against the telephone subscribers in New York city.

Casler Working for Merger

The A. C. Scott valuations of the property of the Automatic Telephone Company of Dallas, Texas, as amounting to $2,521,279.84, which were adopted by the City Commission June 1, as a basis for a new franchise, were accepted June 8 by J. C. Casler, president of the Automatic Company. He said immediate steps looking to a merger with the Southwestern Telephone and Telegraph Company will be undertaken.

C. A. Gates, vice-president and general manager of the Southwestern company, said his company has no statement to make.

The franchise ordinance, to be passed by the City Commission thirty days after Mr. Casler's notice of acceptance, will provide for extensions by the Automatic company and will permit a consolidation if worked out.

The Telephone versus the Slacker

Tests Adopted in France for Detecting the Pretense of Deafness

FEAR that the violent detonations of modern high explosives would result in a large number of cases of complete and permanent deafness has happily proved ill-founded, though there is a certain percentage of men who have become deaf as the result of actual lesions of the middle or the inner ear. Since, however, such denotations often result in temporary deafness, a strong temptation is offered to would-be malingerers on sick-leave to pretend that the affliction is more serious or more permanent than is really the case. To circumvent such shirkers new and ingenious tests have been devised by aurists in the military clinics. These are described in a late number of *La Nature* (Paris), by Dr. Robert Foy, chief surgeon of the Service for Reëducation of Audition and Speech in the Tenth District. After explaining that the object of the medical men is not the punishment of the effort at fraud, but the desire to induce the culprit to see the error of his ways and amend them, Dr. Foy says:

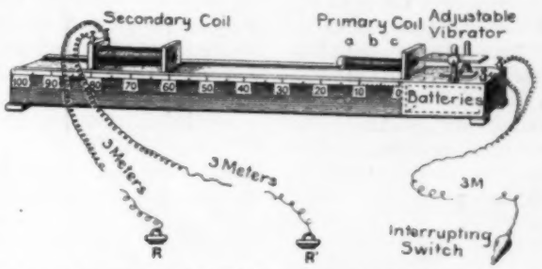


Fig. 1. Acoumetric Inductor Permitting the Variation of Intensity of Sound in the Telephone Receivers, R, R'.

To reveal their very human and temporary trickery, the classic methods of examining the auditory function are insufficient. These (phonic acoumetry, diapason, watch), are in fact based solely on the verbal response of the subject to divers auditory sensations to which he is subjected; in order to detect our "exaggerators" and "continuers" it is necessary to have tests based on exterior objective manifestations which are reflexes of the degree of audition.

There need be no fear of letting these be popularly known; it makes little difference whether the invalids are acquainted with them; they can but submit to their precision. And the very fact that they know of infallible means of detection will prevent them from exaggerating their deafness or persevering in pretense.

Test by the Lombard Deafener.—If we cause the receivers of a telephone to vibrate in the ears of a normal individual reading aloud, we note a marked elevation of the voice; he seeks thus to dominate the noise of the receivers which deafens him and keeps him from hearing himself talk. The man pretending to be bilaterally deaf will raise his voice like a normal person. The genuinely deaf man as a rule will not raise his voice; but there are so many exceptions to this rule that the test can not be accepted as having an absolute value. All these tests are applicable only to very pronounced bilateral deafness.

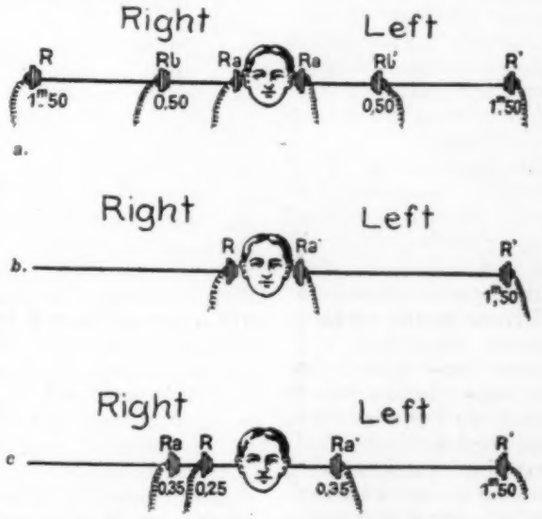


Fig. 2. Reciprocal Acoumetry: the Genuine Unilaterally Deaf Person, Having Nothing in His Right Ear, Hears the Left Receiver at a Distance of One Meter.

Here are others for unilateral deafness:

Tests by Acoustic Tubes.—Two assistants read, in whispers, two different texts into separate funnels, each connected respectively with an ear of the patient by a rubber tube. The "mono-deaf" man will repeat what is read into his good ear; the simulator of unilateral deafness can repeat nothing; for hearing both the texts will confuse him.

The Test of Simulated Obturation.—If we speak to a man genuinely deaf in one ear in a normal voice on the deaf side with the sound ear stopped by a perforated plug, he will repeat our words because he hears them through the sound ear. But the pretender will repeat nothing, since he believes that the ear is really stopped up.

Instrumentation.—The same apparatus answers for all these tests. It is the Faradic apparatus of Gaiffe (Lombard type), which we have slightly modified in its accessories (Fig. 1). It is composed of a coil receiving the current by induction from a fixed induction coil which is placed within it and from which it can be removed by sliding on a carriage one meter long.

In the interior of the box two dry batteries give a steady current until they are used up. A vibrator regulated to its maximum speed permits us to obtain vibrations of a constant value and near to do_2 (medium) in two telephone receivers very equally balanced and connected with the secondary coil. A push button connected with the apparatus by a long conducting wire, permits us to interrupt and reëstablish the current, and consequently the vibrations reëstablish from a distance.

I. *Acoumetric Induction.*—In this test one of the receivers is applied to the ear being examined, the other serves as a control to the operator. The patient is seated as far as possible from the apparatus with his back to it. The secondary coil is placed at the end of the slide at one meter (39 inches), the normal distance of perception, then brought slowly towards the primary coil until the patient perceives an auditory sensation (threshold of audition). If the test is repeated two or three times, trickery on the part of the patient is easily detected by the difference in his responses.

This apparatus permits us, moreover, to appreciate the value of an audition very exactly and to follow, day by day, the progress of an otological treatment.

II. *Palpebral telephonic reflex.*—With the secondary coil barely in contact with the

primary coil, we apply one of the telephone receivers to the ear of a normal subject; we surprise his audition unawares by making the receiver vibrate electrically. This sudden sonorous impression will cause the reflex action of an abrupt winking of the eyes.

In cases of moderate deafness it is necessary to insert half the primary coil within the secondary coil to obtain this reflex. In cases of severe deafness the reflex is not produced until the primary coil is entirely covered. In cases of total deafness there is no reflex.

This test completes the preceding one, in the sense that the patient who pretends to hear nothing in the course of the progress of the secondary coil on the carriage ought not to have the cochleo-palpebral reflex. In the contrary case deceit is evident.

III. *Reciprocal Acoumetry* (Fig. 2.)—This test rests upon the following principle: "Every sound perceived by one ear prevents on the opposite side the perception of sound of equal intensity but at a greater distance."

The patient is seated with his back to the apparatus; a mask over his face prevents him from seeing the operator's different maneuvers. The secondary coil is barely in contact with the primary coil, and remains in this position throughout the test. We establish the current. The tests can be interpreted by the diagrams.

1. In a *normal* subject (Fig. 4*a*), each ear being examined separately, each of the receivers is perceived separately, for example, at 1.5 meters, the one at *R* and the other at *R'*. If we place *R* in contact with the right ear *Ra*, the opposite ear can no longer perceive *R'* except at the contact *Ra'*. The perception of *R* at the contact covers the perception of *R'*. In the same way, placing *R* for example at 0.5 meters (*Rb*), it will be necessary to place *R'* at about 0.5 meters from the left ear (*Rb*) in order for it to be perceived.

2. *In case of complete unilateral deafness* (Fig. 4b), this is genuine if *R'* continues to be constantly perceived at 1.5 meters whether *R* is, or is not, in contact with the right ear. Since the right ear perceives nothing, the perceptions of the left ear are not modified.

The deafness is simulated (Fig. 4), when *R* being in contact, we are obliged to put *R'* at the contact (*Ra'*), for it to be perceived by the subject.

In case of *partial unilateral deafness.* (Fig. 4c).—Suppose for example that the patient does not perceive *R* at the right except at 25 centimeters. This partial deafness is genuine if *R* being placed beyond the auditory limits lindicated by the patient, for example, at 35 centimeters, the left receiver, *R'*, continues to be perceived at the customary distance of 1.5 meters.

This partial deafness is simulated (Fig. 4c), if *R* being placed as above at 35cm. at *Ra*, the receiver *R'* must be placed at 35cm. from the left ear to be perceived (*Ra'*). In fact, it is certain that the patient hears at the right since the perception of the left receiver is influenced. By trials we can determine the true distance of perception of the receiver *R*. This test applies equally to *partial bilateral deafness.*

IV. *Process of the writing machine.*—If in a few rare instances a doubt persists in a case where complete bilateral deafness is claimed here is the ultimate test. The operator simulates in his turn, by accepting the deafness as genuine. The patient is trained in lip-reading for a month. At the end of this time he is summoned.

This is the scene: the patient is in front of us at a distance of 3 meters. Three meters to our left, let us say, is a typist, apparently very much absorbed in her machine. For several minutes we talk to our patient *in a whisper;* anxious to obtain his discharge, he responds marvelously, much too well. At an agreed signal the typist begins to strike her machine with zeal, its noise drowning our whispers admirably; the patient can hear nothing, he understands nothing, he answers nothing; he is a simulator; I can attest that he is able to hear a whisper at a distance of 3 meters; he can give no excuse. If he is really deaf he will feel no embarrassment, for the plot will have passed over his head. After three months of work he would know no more, for it is impossible to learn lip-reading if one is able to hear. And if he refuses to try to learn it is a confirmation of his simulation. A really deaf person is only too happy to make even considerable effort to again be in touch with his kind.

These are the methods by which we may obtain a very precise appreciation of the functional value of an individual's audition. But, as Lermoyez recently remarked, it is necessary to make a distinction in these evaluations between the physiologic audition whose limits are well beyond our real needs (spoken voice 50 meters, whispered voice 15 meters), and practical useful audition, of much more restrained limits (spoken voice 5 meters, whispered voice 50 centimeters). And it is of the latter alone, from the military point of view, that we need to determine the limits.

My personal experience enables me to conclude that a subject hearing the secondary coil at 50 centimeters (acoumetric induction), having a cochleopalpebral reflex, with the secondary coil half covered by the induction coil, possesses a very sufficient, practical, useful audition.

Junking Privilege, $200,000

An offer to the city of Chicago of $100,000 to allow the automatic telephone system to scrap its material was made the council committee on gas, oil and electric light June 16 by Sherman W. Tracy, president of the Chicago Tunnel Company. He submitted a report showing the property would not realize more than $555,000 or $600,000.

Ald. Thomas J. Lynch, chairman of the committee, directed reference of the offer to the commissioner of gas and electricity for a report. The offer represented the city's compensation for setting aside its order of a year ago, when it forfeited the franchise of the corporation.

The city council June 22 accepted $200,000 in cash as a final settlement with the company. Ald. James Bowler led the fight for more money. Some aldermen asked as much as $400,000. A report more than a year ago said the city council could realize from $750,000 to $1,000,000 by disposing of the property.

Attorney Weinfeld pointed out that the lead, copper and brass used in huge amounts in the various plants of the company will now be junked and used for ammunition for the allies. After a consultation with President S. W. Tracy of the company, Attorney Weinfeld offered $150,000 and then $200,000, which was accepted. The company is given six months in which to make payment. It was also asked to put up $300,000 surety.

It is rumored that considerable opposition to the committee's report will develop in the council, and that the ordinance if passed may be vetoed by the mayor.

The committee made preparations for an investigation of the business of the Chicago Telephone Company in order to fix new rates for the next five-year period, which begins in July, 1918. Edward W. Bemis, the committee's utility expert, estimated he could make the investigation for about $86,000.

North Dakotians Hold Session

Independent Association Meets at Minot in Eleventh Annual Convention

TELEPHONE men, members of the North Dakota Independent Telephone Association, met in Minot June 21 in eleventh annual convention. Their sessions concluded June 22.

At the first session W. S. Shaw, president of the city commission of Minot, delivered an address of welcome followed by a response by Judge John Carmody of Hillsboro. Then came the annual address by H. W. Wilson of New Rockford, president of the North Dakota Telephone Association, followed by the annual report of Secretary H. A. Livermore of Fargo. Later committees were appointed and questions were received for the question box, which were later made a part of the program.

In the afternoon the members went "exhibit visiting" immediately after luncheon, after which the convention was called to order for its first regular program of addresses. Among those on the program were E. C. Kast, executive agent of the Minneapolis Independent Telephone Association, on "Telephone Companies, War and Signal Corps." The Rev. Cecil Leslie Clifford of Minot spoke on "A Layman's Impression of the Telephone."

The second day Frank M. Packard, chairman of the state tax commission, made an address on "Telephone Taxation," and Representative Nels Magnuson of Souris spoke on "Telephone Legislation." H. L. Reade, state fire marshal, discussed "Protection from Power Lines."

"Telephone Taxation" was the subject of Frank M. Packard, chairman of the North Dakota Tax Commission, who was the only speaker at the morning session. The value of telephone property is being studied thoroughly by the commission, he told the telephone men, and said that in a short time the commission hoped to have the taxation problem for the telephone companies worked out so that both sides will be satisfied. There has been some protest among telephone owners against the taxation, they declaring that the valuation is not determined in a way to be just to the telephone companies.

After the address by Mr. Packard the telephone visitors were taken in a bus to the Minot State Normal school, where they were in time to hear part of the program by the Minot normal students. The members of the association were given a surprise by Miss Sigrid Reishus, who sang "Hello, 'Frisco," the popular telephone song, in a sweet and attractive tone.

President H. W. Wilson, of New Rockford, in his address, declared that if the telephone owners are going to meet the demands for better service some would have to raise their rates or go out of business. He claimed that by private ownership of telephones they would be free from control of political patronage.

After discussing taxation of telephone property he recommended the following:

That a committee of three be elected as a committee on taxation. This committee to ascertain whether property returns are properly made out and filed; to attend all meetings of the Board of Equalization on taxation of telephone companies with respect to valuations; to make such investigations as will definitely determine whether telephone property is receiving fair consideration in valuation and to properly and respectfully protest against any method of valuation which shall cause any unfair valuation of telephone property, provided, of course, that no telephone company shall be prevented from attending to these duties for itself, if it so elects, and that the expenses of such committee shall be borne by the association.

That a legislative committee be elected or appointed who would go to the legislature on behalf of the association and look over the bills that are introduced, the committee to have its expenses paid by the association.

In making the latter recommendation President Wilson said: "For if we are to judge the future by the past, there will be many bills introduced that would not be if the parties introducing them were familiar with the telephone situation of the whole state."

The war, he said, would seriously cripple the telephone companies, but despite this he urged that those who could be spared should do their part by enlisting in the signal corps.

First Lieutenant D. B. Robinson, of Minneapolis, who has charge of the recruiting for two companies of the signal corps in the Northwest, explained the duties of the men joining this branch of the service. The war department has left the problem of recruiting signal companies to war strength to the telephone companies. The Northwest district is expected to raise two companies, he stated, and thus far has contributed but 59 men familiar with telephone service. One hundred and fifty-six are needed, he said, considering the number who will be rejected on account of physical defects.

Mobilization of these signal corps is not expected until September 1 or perhaps October.

Rev. Cecil Leslie Clifford, Minot's orator, expressed the layman's view of the telephone and gave some interesting statistics on the telephone service, as well as delivering an address that was thunderously applauded.

Men representing wholesale telephone supply houses warned dealers to buy normally and to purchase only the goods absolutely needed.

H. A. Livermore, of Fargo, secretary of the association, read a telegram from Bismarck inviting the association to convene there next year.

President H. W. Wilson's address in part follows:

We have seen one of the greatest changes in the political situation of our state that has ever been seen or heard of in the history of our nation, and yet I feel that we as telephone men have nothing to fear. I do not see that the political change is going to make any material difference in the telephone industry. In the past years many new exchanges have been built, and many new rural telephone companies have been organized and incorporated. These changes have taken place mostly in the western part of our state, where the new lines of railroad have been built.

The demand for more and better service has been ceaseless and the energies of our telephone men have been so occupied with meeting this demand, that many of the other important matters have been neglected. The demand for more service and the high cost of material have been such that in many cases all of our earnings have been used in making extensions and betterments to the service, while the rates notwithstanding the high cost of material and the added expense of operation have remained the same. Many of you no doubt have felt that you would have to make some adjustment in the matter of rates, but are putting it off from time to time. If you are going to meet these demands for better service some of you are going to have to raise your rates or go out of business.

We have a right to expect and to get such rates as will allow us a reasonable rate of interest on our investment, and a reasonable allowance for depreciation, and to expect proper consideration from our Public Utilities Commission, which is our Board of Railroad Commission, and if we are to receive that consideration we must be able to at all times show efficiency in

our management and in the proper developments of our respective districts or territories.

The question of government ownership vs. government control is one that is facing us at this time. Notwithstanding the agitation for government ownership, I believe that the public can best be served by private enterprises. I believe that it is only necessary for the student of this question to compare the telephone situation and the quality of service rendered in this country, with that of the foreign countries, such as England, France or Germany. Although the systems of government in these foreign countries are much more favorable to efficient results than a government such as ours where the service would be given over to the political patronage.

He also discussed the taxation of telephone properties, declaring that the telephone property has been higher taxed in this state than an equal investment in other kinds of property owing to the erroneous methods of arriving at the valuation of the properties of the telephone companies.

In speaking of the rural problem he said:

"The rural problem is one that has been the cause of considerable dissention or misapprehension among the telephone managers and their patrons of the rural lines, and I think this has come about by a misunderstanding." The remedy, he pointed out, would be a more friendly relationship between the farmer and the telephone manager and to talk over complaints on the service.

In closing Mr. Wilson spoke of the great war.

We are today face to face with a crisis the magnitude of which few of us can realize or imagine. Our beloved country has been forced into the world war in order to preserve that for which our forefathers fought, namely, liberty. This war is not a war of aggression, but it is a war of preservation. It is a war of democracy against autocracy, of imperialism against the rights of humanity. If we are to preserve our national honor we will have to do our part and put our shoulder to the wheel and push. Some have said that the war will end soon—God grant that it may—but do not feel yourselves, do not think that this is any child's play, for it is not. We have a formidable foe to fight. At first it was imperialism trying to rule the world, but now it is imperialism fighting for its life, and it is not going to yield up the crown as long as it can command men and boys to take up arms and fight, and I would not be surprised if women were forced to take up arms and fight shoulder to shoulder with the men in the trenches.

There is work for the telephone men in the signal service corps and the government today is calling for men to fill up these ranks, but the telephone service is just as necessary at home as it is in the army, and the government is only asking for those who can be spared without deteriorating the service at home.

Many of our young men have already responded to the call and many more will have to go. The telephone industry is going to suffer severely from this cause, but when the war is over and swords are beaten into plowshares and spears into pruning hooks, peace everlasting and eternal will reign secure, and Old Glory, that emblem of liberty, will be found flying over all the world and in place of a United States a United Nations will prevail where all men are free and equal.

Bismarck was selected for the next convention in June, 1918. Officers were elected as follows:

President, H. W. Wilson, New Rockford; vice president, J. P. Smith, Beach; secretary and treasurer, H. A. Livermore, Fargo; executive committee, J. O'Keefe, Cavalier; M. M. Borman, Abercrombie; A. T. Nicklawsky, Hillsboro; A. J. McInnis, Dazey; C. H. Coar, Minot.

Red Cross Gets Field Telephones

"The Red Cross takes pleasure," says F. B. Morehouse, head of the Milwaukee chapter, "in announcing that the request for $1,800 for a field telephone system for the base hospital has been answered by the Wisconsin Telephone Company, which has given a complete outfit without cost to us. The only thing lacking to complete the hospital equipment is an X-ray machine that will cost $3,500, and we would appreciate donations for that purpose."

Tornado Effects in Kansas

The tornado that visited Kansas last month hit the Missouri and Kansas Telephone Company pretty hard. One stretch of six miles of wires was torn down by the storm, making it the worst instance the company had to handle. One hundred twenty-two miles of wire service were involved by this break.

In the rural district around Topeka 215 poles were down, 400 exchange subscribers being involved and forced to do without service until the line was restored, and more than 19 miles of wire had to be replaced. As a rule the men are able to mend the break or use the old wire, but in the tornado the wire was blown by the wind for miles. Some of the wire has not been found. In many places the poles were snapped off near the base and these had to be replaced.

Iowa Rurals Get Together

Nine rural telephone companies and the Casey Mutual Telephone Exchange held a meeting in Greenfield, Iowa. W. A. Woodruff was chairman of the meeting, and S. L. Rutt was secretary pro tem. The object of the meeting was to effect a merger of the several organizations, a step that has been formally under consideration for a considerable time. So well had the ground been prepared in advance, and such was the measure of unity, that the meeting was a very harmonious one. The main object was consummated and the 10 companies concerned were duly consolidated under the name of the Casey Mutual Telephone Company. Directors were elected as follows: J. A. Cline, G. W. Rutt, E. W. Grinnell, F. W. Land, D. E. Herriott, A. M. Fagan, W. A. Woodruff. The board met immediately after adjournment and elected officers as follows: President, W. A. Woodruff; vice-president, E. W. Grinnell; treasurer, H. E. Smith; secretary, A. M. Fagan. The amount of the capital stock is $15,000, distributed in 500 shares of $30 each.

Iowa's Big Merger

The Iowa Telephone Company has purchased the Farmers and Merchants Telephone Company of Webster City, Iowa. Along with the Webster City plant, the Farmers and Merchants Company also sold all its other plants to the Iowa Company. The former concern owned some thirty-five plants over northwest Iowa, all of which are now in possession of the Iowa Telephone Company.

This transfer involved one of the largest sales of public utilities ever consummated in Iowa. The consideration is not known, but as the Webster City plant is valued at about $200,000, the 35 plants, large and small, ran well above a million dollars. The central offices of the Farmers and Merchants Company have been located at Storm Lake, Iowa, and presumably the headquarters will remain there. The transfer will not mean any change in the policy as to the conduct of the plants. The plants involved in Hamilton county are Webster City, Blairsburg, Williams and Jewell. R. L. Sterling will continue as manager of the Webster City plant.

Independent Telephone Companies at Lanark, Ill., have consolidated under name of the Lanark Mutual Telephone Company.

Public Utilities and the Law

An Address Delivered at a Southern California Employes' Meeting

BY E. W. CUNNINGHAM

FROM the point of view of the law the characterizing feature of a public utility, as distinguished from a private calling, is that the individual or company which conducts the public utility must serve at reasonable prices all who make a proper application for service, regardless of whether that individual or company desires to give the service or not, while on the other hand the law leaves one engaged in a private calling free to choose those with whom he will have business transactions. The law, on first thought, might seem to be inconsistent in compelling the inn-keeper to feed and house all travelers at reasonable prices while at the same time it allows the grocer to see his enemy who stands ready to pay any price demanded for food die of starvation in front of his very door; and lawyers are often asked why it is that those who invest in public utility property are permitted to earn only a comparatively small return on their investment, while there is no limit to what those who embark in a banking enterprise may earn, so that in some cases they receive a return on their investment of two or three hundred per cent per annum, and even more.

The law has always acted on the theory that competition was a sufficient force to regulate the private callings, so that the freedom of individuals engaged in such callings in making such contracts as they desired, should not be interfered with, and probably the economic conditions and surely the economic theories of the past have justified the law in taking this course. But in callings where that element of competition was normally missing, avarice on the part of those engaged in the calling and the necessities on the part of those dependent upon its services made necessary a regulatory restraint on the part of the law. Back as far as the first part of the fifteenth century, the common law recognized as resting on callings where this element of a practical monopoly normally existed, the duty to serve all at a reasonable price. And in spite of the fact that the callings that have been subject to this obligation have changed greatly from time to time as economic conditions have changed, the general underlying principles of public utility law have remained the same. Economic conditions have merely changed the result of the application of these principles.

ELEMENTS OF MONOPOLY.

The elements of a monopoly in a calling which cause the law to treat it as a public utility may come from one or more of several different sources. The most easily recognized monopoly is that which results from the grant of an exclusive franchise by the state. The grantees of practically all special favors from the state, such as the right of eminent domain and the privilege to use the public streets and highways in building pole lines or railway tracks or laying pipes, are subject to the duties resting on public utilities, but it is probably in the majority of cases more correct to say that they may be granted these special privileges by the state because they are public utilities than to say that they are public utilities because they are granted these special privileges. But today at least a calling is more apt to be classed by the law as a public utility because of natural or economic causes which give it a practical monopoly. Companies distributing water and natural gas have a practical monopoly because the supply of the commodities as a rule is limited. Electric companies, telephone and telegraph companies, and railroads are public utilities because service on a large scale is necessary, and the cost of a complete system is very great. It would result in a gross economic waste if these systems were to be duplicated to such an extent that competition could be relied on as a regulating force, and such duplication would mean that the cost of service would be greatly increased. The innkeeper's obligation to serve all who apply results from the necessities of the traveler when hunger or night time overtakes him in his travels. Warehouses, stockyards and elevators owe their monopoly to the scarcity of appropriate sites upon which such business may be successfully conducted.

As has been stated, the determination of the callings to be classed as public utilities is an economic rather than a strictly legal matter. During the fifteenth century the surgeon, the veterinarian, the tailor, the smith, the baker, the miller and the butcher were all held to be engaged in public callings, and under obligation to serve all who applied. This was because the numbers engaged in these callings were so limited as to give those skilled in these matters a practical monopoly. Today we have almost an entirely different class of public utilities, the only two callings that have continuously been classed as public callings being innkeepers and public carriers. When cases first came before the courts of this country, making necessary decisions as to whether certain of these new callings were under obligation to serve all who applied, the courts were rather slow to recognize the underlying principles which place upon certain callings this duty, but they reached the proper result in the case of telegraph companies by arguing that they should be classed as public carriers, as their business was to carry messages, and in the case of sleeping cars by calling them traveling inns. It is interesting to speculate as to whether in the future other callings will be classed by the courts as public utilities which are not now so classed. This could not be done merely by a legislative declaration, in the absence of the economic conditions which would justify such a declaration. An attempt by the legislature to regulate as a public utility a calling not in fact one, would be taking of property without due process of law, and contrary to the constitution of the United States. But trade unionism, greater aggregations of capital, greater co-operation between capital and labor, the much greater co-operation in and between all departments of activity which is resulting from the present war, are changing economic conditions greatly, and it is quite possible that before the lapse of many years the list of callings impressed with the duties of public service will be greatly increased.

PUBLIC UTILITY'S OBLIGATIONS.

Generally speaking, the obligations resting upon a public utility may be classified under the four following headings:

(1) The duty to serve all who apply; (2) The duty

to serve at reasonable rates; (3) The duty to furnish adequate facilities; and (4) The duty to serve all without discrimination.

The duty to serve all must necessarily be supplemented by the duty to serve at reasonable rates and the duty to furnish adequate facilities, for otherwise the duty to serve all could be avoided either by charging prohibitive rates or by offering entirely inadequate facilities.

The duty to serve without discrimination is of recent development, and is stated by most authorities not to have existed at common law. All of these four duties are relative rather than absolute and without limitation. The duty to serve is limited to those who make proper application and are within the class the public utility holds itself out as ready to serve (e. g., those living within a certain district in the case of a public utility distributing water, gas or electricity). The public utility is also entitled either to prepayment or certain assurances of payment for the service it is asked to render. The obligation to furnish adequate facilities does not put upon the public utility the burden of entering fields of service never contemplated or professed by the utility. The provision against discrimination does not prevent the rendering of different kinds of service at different rates—for example, lighting service may be rendered at one rate and power service at another.

Prior to 1902, the regulation of public utilities and the enforcement of these four duties were effected through actions at law between the utility and its customers and through general regulation and rate fixing enactments by legislative bodies. Under these conditions the customer found, as a rule, that it cost him more to enforce a certain right he might have against the public utility than the right itself was worth. Rates were fixed by city councils and state legislatures with little consideration of the fundamental principles involved, and the matter of lowering rates was often made a political issue. In some states statutes were enacted fixing certain flat rates to be charged by all public utilities of a certain class operating within the state without regard to the peculiar conditions under which they were operating.

DISPARITY OF RETURNS.

Such a statute might bring an extremely large return to one company, while at the same time it might mean bankruptcy to another company conducting a utility of the same kind under different conditions. The only relief a public utility company would obtain from rates fixed in this manner, which did not give it a reasonable return on its investment, was to go into court and seek to have the statute declared unconstitutional under the United States constitution on the ground that it deprived it of its property without due process of law.

Public utilities were often forced into politics for their protection. This system of controlling public utilities was, therefore, satisfactory neither to the customer nor the public utility companies.

In 1902 the legislature of the state of Massachusetts and in 1905 the legislature of the state of Wisconsin passed statutes creating commissions having general regulatory powers over public utilities, including the power to fix rates. Similar laws now exist in practically every state in the union. This new method of controlling public utilities and of enforcing the duties they owe to the public has been much more successful than the old method, and the change has the approval of both the consumers and the public utilities. The rights of the consumers are enforced speedily and with little, if any, expense on their part. Problems of control and rate making have been put upon a scientific basis. Reasonable returns from public utility investment have been made more certain and public utility securities have therefore been made more marketable.

Prizes for Exchange Names

In an effort to get away from the conventionality in exchange designations, the Pioneer Telephone Company is offering prizes for the best suggestions for the name of a new exchange in Tulsa, Okla.

Answering the demand of the fastest growing city in its territory, the Pioneer Company will immediately begin the installation of another exchange in the Tulsa office, to be finished some time next fall. The new facilities thus afforded will enable the company to practically double its service.

There are now approximately 10,000 telephones in Tulsa, or more than in any other city of its size in the country. This number is the maximum that can be handled by the one exchnge system now in use. To establish another unit will be to double the capacity of the Tulsa system.

More than 350 operators are employed on the switchboard at the present time, and the proposed improvement will make room for many more girls.

"The only feature that we are anxious about under the new system," said George F. Bell, local manager of the Pioneer Company, "is the fact that some confusion may be caused by the innovation of the exchange system.

"After the improvements are made there will be two telephones listed under the same number, distinguished only by the name of the exchange. It is of prime importance that the name of the exchange be prefixed to the number."

To impress upon the public mind that there will be two exchanges, the telephone company announces a contest, which is explained in a newspaper advertisement. The contest provides for two prizes of $10 and five of $1 each to be given for the best names suggested for the new exchanges.

According to Mr. Bell, the Pioneer Company desires to get away from the conventional "Maple" and "Walnut" by which a majority of cities designate exchanges. By means of the contest it is hoped to procure some original names which will be in keeping with the originality of Tulsa.

Northwestern Making Rural Friends

Owatonna, Minnesota, and surrounding country territory is the most fully developed telephone center in the state, having the largest number of rural telephone subscribers connected with the local exchange, besides one of the largest city exchanges. Twenty-two different farmers' organizations maintain these rural lines in the county.

In recognition of this fact the Northwestern Telephone Company has started a school for the linemen and officials of the various rural companies to teach them how to maintain, construct and repair their lines the most efficiently and economically. The instruction is given without charge, and the rural telephone men are taking great interest. The school is held every Saturday afternoon during the slack season.

Independent Traffic Committee Meets

Successful Session at Grand Rapids Starts Action on Many Enterprises

WHAT was considered to be one of the most successful meetings of the Traffic Committee of the United States Independent Telephone Association was held at Grand Rapids, Michigan, June 5, 6 and 7. There were present on the Traffic Committee: Chairman A. J. Shands, of St. Louis; H. E. Davis, of Kansas City; Frank V. Newman, of Grand Rapids; C. K. Gann, of Lincoln; C. E. Smith, of Grand Rapids; W. I. Howard, of St. Paul; Martin Umbach, of Ft. Wayne; and Secretary W. S. Vivian, of Chicago.

There were also present: C. R. Johnston, of Columbus, Ohio, chairman of the Service Committee; E. B. Fisher, of Grand Rapids, chairman of the Board of Directors of the United States Independent Telephone Association; and Messrs. Dudley, of the Kellogg Switchboard & Supply Company, Mooney of the Automatic Electric Company, Tarte, general manager of the Citizens Telephone Company, and Hutchins, traffic superintendent of the United Home Telephone Company, Muskegon, Michigan. There were absent: T. J. Tune, traffic manager, Ohio State Telephone Company, Columbus, Ohio, and C. E. Doolittle, traffic manager, Citizens Independent Telephone Company, Terre Haute, Indiana. The first session was held Tuesday morning at the Pantlind Hotel.

After the meeting had been called to order by Chairman Shands, he called on E. B. Fisher for a talk. Mr. Fisher responded by calling attention to the fact that on that morning there were 16,174 telephones on the Grand Rapids exchange, 3,000 more than the Bell Company had in all Michigan twenty years ago. Mr. Fisher related something of the history of Grand Rapids, and assured the visitors that they were most welcome, and he hoped they would have such a good time that they would come again.

One of the most important matters that received the attention of the committee was the advisability of preparing and publishing a correspondence course for operators on "Long Distance Operating."

After the subject was introduced, Mr. Gann, of Lincoln, gave an account of their experience with the correspondence course throughout their territory. Among other things, Mr. Gann stated that they had made an actual cash expenditure of considerably less than one thousand dollars, and estimated that the efficiency and capacity of their employees and plant would be increased to such an extent that it would result in a saving of many thousands of dollars this year.

Every one present actively participated in the discussion of this subject, and as its possibilities developed, the committee were convinced that if such a course could be prepared and published and the work financed, it would be a service that would be well worth while, and one which would result in many benefits to the companies throughout the Independent telephone field.

The motion was finally put and unanimously carried that a sub-committee be appointed to work out such a course. The members of this committee are Messrs. Newman, Davis, Gann and Vivian.

This sub-committee arranged to meet in Grand Rapids the week of June 18 to proceed with this work, and it is hoped that the entire work can be completed and that the approval of the Service Committee can be secured in ample time to be ready to offer the course to the Independent telephone companies throughout the field on September 1.

Action was taken by the committee, authorizing the publication at the earliest convenient time of a Peg Count Bulletin. This has already been completed, and all that is necessary before publishing is to secure the approval of the Service Committee.

A committee consisting of Messrs. Shands, Davis and Gann was appointed to prepare a bulletin on "Equating Traffic."

A committee consisting of Messrs. Shands, Howard and Smith was appointed to prepare a bulletin on "Tributary Traffic."

A committee consisting of Messrs. Davis, Doolittle and Howard was appointed to prepare a set of operating instructions for magneto, common battery and multi office operating.

During the three days the committee was in session the committeemen were splendidly entertained; the Citizens Telephone Company and the Michigan Independent Telephone and Traffic Association vieing with each other to see that the visitors had a good time. On Tuesday noon the traffic association entertained the visitors and the ladies at a luncheon at the Pantlind Hotel; Tuesday evening they were entertained by the Citizens Telephone Company with a sight-seeing trip throughout the city and a dinner and theater party. Wednesday evening the traffic association entertained with an automobile ride and a dinner party at Macatawa Park.

The next meeting will be held in July in Chicago.

Chromium Steel Permanent Magnets

An investigation into the suitability of chromium steel for permanent magnets has recently been carried out in Germany and reported upon to the *Physikal-Techn, Reichsantalt*. Figures are given for five bars of chromium steel, these being compared with five bars made of tungsten steel, the product of remanence and coercive force being taken as a criterion of quality. The remanence of the chrome steel bars was further tested under 20 hours' heating at 100° C., six heatings up to 100° C. and 20 falls from a height of 2½ metres on to a wooden block. It is concluded that carefully prepared chromium steel is a suitable substitute for tungsten steel.

Making Telephone More Efficient

In order to keep disturbing sounds out of the ears and to amplify the sound, particularly in the instance of long-distance calls, there has recently been introduced a device which can be used with the ordinary telephone instrument, but which is not an attachment, and therefore cannot be objected to by the telephone companies. This device consists of a sound chamber over which is placed the telephone receiver instead of putting it up to the ear, and two adjustable hearing tubes. Simple means are provided for fitting the tubes to the individual, thus leaving his hands free.—*Scientific American.*

"The United States"

From the Telegraph and Telephone Journal, London, England.

There is no craft kinship between our country and the United States more close than the kinship of telegraphs and telephones. We have visited each other; we have copied each other; we have paid each other the tribute of envy of circumstances which rendered telegraphy or telephony more adaptable to social and economic needs; we study each other's journals, and we co-operate so closely that many contributions appear on both sides of the Atlantic. The step from benevolent neutrality to actual armed alliance is a smaller step in closeness of association in respect of our craft than it is in any other respect. Now we are closer than cousins; we are allies. The spirit of a new friendship throbs in our hearts. It became almost tangible to us in General Post Office North, when the great crowds surged about St. Paul's Cathedral, and Julia Ward Howe's "Battle Hymn of the Republic" sounded round the great dome. If only telephony were not in its infancy we should like to have invoked Mr. Carty's aid and to have spread that solemn chorus throughout the vast enterprise of the American Telegraph and Telephone Company. What an opportunity for the arts of the electriphone! How we should like to have carried to a thousand telephone receivers from New York to San Francisco the great jubilant dedication of "the trumpet that shall never call retreat."

They, our cousins, are to learn by our experience. In the matter of our own craft we have much to tell them. The past three years have been packed with telegraphic and telephonic events. Some we have recorded in these pages; some, to our regret, must still be kept secret. One experience our cousins are bound to have in which their English friends will be interested in an especial degree. We shall watch the government control of telegraphs and telephones with the kindliest of eyes. It may be that it will affect the general attitude to this question much as the government control of railways in England has affected the general attitude of the nationalisation of railways. There are still opposing opinions on that subject, but they are stated in a different form; there is a greater readiness on each side to see the strength of the opposing case. Our friends who become civil servants at a dramatic moment in their country's history, even if it be a temporary experience, will be able to throw new light on the problem.

And we shall look with particular interest at their professional experiences. Their enterprise and ingenuity will find new paths; they will find problems which call for solutions even more swift than they are accustomed to apply. Probably some of our problems, now familiar to us, will not be presented; the Zeppelin will not call for an adaptation of the telephone service such as that which we had to discover. But when the time comes for a correlation of telegraph and telephone experiences there will be interesting ventures to disclose. If it should happen that under the Stars and Stripes something of the nature of a signal company should come to our shores, we promise it a welcome which will be a real and present evidence of the sense of fellowship which always has existed and which the present grim tragedy has strengthened and deepened.

The Tri-State Telephone and Telegraph Company was authorized by the state warehouse and railroad commission to purchase the physical property of the Minnesota Telephone Company at Brainerd, Waukon and Onamia.

Government Service First

Practically all telephone employes have received instructions to give any local or long distance telephone messages relating to military matters precedence over all other calls. The installation of any equipment to be used for military work is also to be given preference over installations for private parties.

Any telephone calls to or from government or state officials relating to federal or state troops, army supplies or Red Cross work come under the special instructions regarding the handling of military messages or installation of equipment.

Many telephone men have volunteered for the thousands of signal corps companies the telephone people are raising. Those will be taken who are best fitted for the work, which will be largely the building and maintenance of camp and field telephone lines.

Government officials, in asking for volunteers for the Signal Service, emphasized the fact that at this time it is very important that the telephone service throughout the country be kept at a high state of efficiency. For this reason, they say it should not be unduly crippled by too many men leaving for army work who are needed to keep up the service at home. A number of men volunteered for the Signal Corps who cannot be accepted because they are needed to keep this service in operation.

All men who enter the signal service will be given their present full pay for a year by the Bell companies, less what they receive from the government. These men will also retain their disability and death insurance benefits from the company while away, and will be re-employed when they return.

The Bowman (N. D.) Commercial Club is completing the organization of a stock company of farmers and business men of Bowman to erect about 200 miles of telephone line toward the Camp Crook and Buffalo, South Dakota, territory. Already enough stock has been subscribed to carry the construction to the state line on the south.

E. C. Stoeffhaas, former president of the Rebuilt Telephone Equipment Company, has established himself as general manager of the Rebuilt Electric Equipment Company at 2157 West Twenty-first street, Chicago. He is prepared to make interesting figures on the rebuilding of telephone equipment of every description.

The Frank B. Cook Company of Chicago has acquired a new engineer and sales manager in the person of Jay G. Mitchell. Mr. Mitchell is so well known to the telephone trade, both manufacturing and operating, that further comment is unnecessary. Friends of both Mr. Mitchell and the Cook Company will be glad to hear of the affiliation.

Catalog No. 50 of the Leeds and Northrup Company of Philadelphia relates to portable testing sets and cable testing apparatus, including factory cable testing.

The R. Thomas & Sons Company, East Liverpool, Ohio, has prepared a large and sumptuous catalog of insulators, containing over a hundred pages.

Loaded Telephone Circuits

*Characteristics, Testing and Design of Loading Coils and Field Testing Sets—Continued from June**

BY W. N. FURTHMAN

This article describes the loading of a telephone circuit, either for aerial or cable services; phantom or non-phantom loaded circuits; the spacing of aerial and cable coils; degrees of loading and method of spacing coils; field testing to determine accuracy in loading and quality of coils produced by manufacturers. It also treats of the design and construction of high efficiency loading coils that made transcontinental service successful.

FOR the purpose of measuring crosstalk between telephone circuits of various kinds, this universal shunt has been arranged as a crosstalk meter of the form shown diagramatically in Fig. 1. Externally this meter has a pair of binding posts marked "Talk," a second pair marked "Listen," a single binding post marked "Shield" and a rotating switch making contact with a row of buttons. Each contact button has a number marked opposite to it. Internally the meter consists of a number of resistances connected between these contact buttons and terminals in the manner shown in this drawing. These resistances have such magnitudes that the resistance across the terminals marked "Talk" is always practically 660 ohms, irrespective of the position of the rotating switch. They are also so proportioned that if an alternating current of voice frequency is passed through the meter by applying a voltage across the terminals marked "Talk" and a standard bipolar receiver is connected across the terminals marked "Listen" the number beside the contact button with which the rotating switch is in contact indicates the current flowing through the receiver in terms of millionths of the current flowing through the "Talk" terminals.

Fig. 1 also shows the connection of the circuit used in making crosstalk tests. In this diagram are indicated the terminals of the two circuits between which the crosstalk is being measured, together with the following apparatus: Two standard common battery substation sets to be used one for talking and one for listening, 24 volt batteries feeding these substation sets through repeating coils, crosstalk meter, switch and wiring connecting the various parts of the circuit together. To prevent excessive direct current in the transmitters 20 ohms is shown added in series with each substation set. The shield of the crosstalk meter is grounded.

It can be seen from the diagram that when the switch is thrown to the right, one substation set marked "Talk" is connected to one of the two circuits whose mutual crosstalk is being tested, the other substation set is connected across the second circuit being tested and a standard bipolar receiver is connected into the usual place in this latter set. When the switch is thrown to the left, the talking set is connected across the "Talk" terminals of the crosstalk meter and the receiver is switched across the "Listen" terminals of the crosstalk meter.

One experimenter then talks into the set marked "Talk;" usually counting in an even and a fairly loud tone as follows: "One, two, three, four, five; one, two, three, four five," etc. The observer at the listening set throws the switch back and forth in time with the successive series of counts. When the switch is so placed that it throws the sets on the actual circuits, he hears the crosstalk that is being measured. When the switch is reversed he hears a volume of sound from the crosstalk meter depending upon the position of its rotating switch. He then adjusts the position of this rotating switch until he hears the same volume of sound from the meter as from the line. The number opposite the contact button at which this balance occurs is then taken as the measure of the crosstalk between the circuits being tested.

In places where common battery substation sets cannot be conviently employed, local battery sets may be substituted for them. The repeating coils will not then be required for battery supply to the transmitters. These coils should, however, still be inserted (with no battery connection) in order to reduce the possibility of the terminal conditions unbalancing the line. The switching arrangement will not differ from that shown for common battery sets, i. e., two switch points will move the talking set from one of the lines to the meter, and the other two will move the receiver from its proper position in the listening set to the meter.

Crosstalk between telephone circuits can be measured in this way, irrespective of the kind of unbalance which produces the crosstalk.

The following are places where crosstalk tests of the kind noted above may be of large value:

(1) Between open wire circuits, especially between phantom circuits and their sides. This is for the purpose of determining the effectiveness of the transposition scheme being used and the crosstalk due to the phantom coils or other connected apparatus.

(2) Between cable circuits, especially when loaded, and especially between phantom circuits and their sides in duplex cables and between different phantoms when carried through lengths of non-duplexed cable.

(3) Between cord circuits in switchboards and including the crosstalk due to battery supply leads.

Crosstalk between two circuits may be caused by capacity unbalance between these circuits or by mutual inductance unbalance between them or to a part of the two circuits being common to both. Between open wire circuits both capacity and inductance unbalances are important. In cables the capacity unbalance is important and the inductance unbalance usually negligible except between phantom circuits in non-duplex cables. In battery supply leads the crosstalk between circuits is due to the fact that the battery supply leads are common to the various circuits fed from the battery.

When crosstalk tests are to be made the circuits should be tested as nearly as possible in their normal condition in order that the crosstalk heard shall be a true measure of that actually occurring between subscribers when the circuits are in use. Before commencing such

*ERRATA: In the June installment, the equation nine lines from the bottom of first column, page 297, should read

$$(x_1-A_1)+(x_2-A_{20})-(x_3-A_3).$$

The equation constituting the fourth line of column 2, page 297, should read

$$A=\frac{R_{1000}+m\,L\,X\,1}{K}$$

The equation immediately under it should read

$$m=\frac{2\,K\,A-R_{1000}}{L}$$

tests preliminary electrical tests should be made to insure that the two circuits are in good condition; that is, that they are free from fault and conditions of low insulation and that the loop resistances are normal. If these precautions are not taken it will be difficult to assign the proper cause for any crosstalk that may be found.

After the circuits are known to be in good order the crosstalk test should, as noted above, be made on the circuits under as nearly normal conditions as possible. For example, it is evident that incorrect results would be obtained if the crosstalk between two short cable circuits were measured with the distant ends of the pairs short-circuited, since the voltage across the circuit being talked into would under the circumstances be much lower than under ordinary conditions and also the effect of the induced voltage on the second circuit would be different from that under normal conditions. Likewise, incorrect results would be obtained in measuring crosstalk due to inductance unbalance between two short lengths of circuit with the distant ends of the circuit left open, since in this case very little current would flow.

It is often not satisfactory, however, to connect the distant ends of the circuit to the apparatus and lines normally connected to them, since the added apparatus and lines may themselves bring in crosstalk which it is not desired to measure and which will mask the results sought for. As the average impedance of the apparatus and the lines connected to any part of a telephone circuit is roughly 1,000 ohms at telephonic frequencies it will generally be satisfactory to short-circuit the distant ends of the circuits under test through non-inductive resistances of about 1,000 ohms each—care being taken to see that these non-inductive resistances are well insulated and free from accidental ground.

When making a considerable number of crosstalk tests on a group of fairly long circuits, it will be satisfactory to test the circuits with the distant ends open. If there is any doubt about such procedure giving correct results, tests should first be made between a few circuits using the 1,000-ohm resistances at the ends and then with the ends left open to see if any differene can be detected.

As the making of crosstalk tests by actual talking observations may become laborious if a large number of tests have to be made at one time, it is often satisfactory, where a high degree of refinement in the work is not required, to substitute a "howling" telephone in the talking set for individual talking. This merely consists of placing the receiver of the talking set against the transmitter in such a way that the set howls continuously and of utilizing the tone thus obtained as a source of sound instead of the counting. Results with the howling set are usually from 0 to 50 per cent higher than with talking tests and where very large crosstalk values are found under such conditions the howling tests should be checked by actual talking tests.

The maximum allowable crosstalk varies greatly with the point in the plant at which it occurs; for example, a given volume of crosstalk direct at the subscriber's set is much more objectionable than the same volume of crosstalk in the middle of a toll line. Tests have shown that a value of crosstalk as large as 1,400 meter units between subscribers may not under ordinary conditions seriously interfere with each carrying on conversation with a second party even when such conversation is being carried on over a circuit having a transmission equivalent as high as 30 miles of standard cable. However, such a value of crosstalk is annoying to the subscribers, is large enough to permit a conversation overheard by it to be sometimes understood and if the transmission equivalent of the circuit over which the subscribers are talking is in excess of 30 miles it becomes decidedly objectionable. In any case, therefore, where crosstalk as large as this would occur between subscribers every effort should be made to locate and eliminate the cause. Only where the cost of clearing the trouble would be excessive and where there is little or no long distance business can crosstalk as large as this at subscribers' stations be considered permissible.

While it is practically impossible to fix definite rules for the maximum crosstalk allowable in different parts of the plant the fact that crosstalk undergoes the same transmission loss in passing over a circuit that ordinary conversation does, combined with actual tests on numerous classes of working circuits that are giving satisfactory commercial service, seems to justify setting the maximum permissible value of crosstalk at the terminals of toll and trunk lines at not to exceed 1,400 meter units, that is, the maximum value between subscribers that can be tolerated.

If it is practicable to keep within this maximum value between toll and trunk circuits measured at the ends, as noted above, the maximum crosstalk between subscribers should in the great majority of cases be well within the allowable limit. This results from the fact that if a certain value of crosstalk is found at one point in the circuit by measurements of the kind noted, then the crosstalk actually heard between subscribers due to the unbalance will be this crosstalk decreased by (a) the transmission loss between the subscriber talking and the point at which the crosstalk occurs and (b) the transmission loss between the point at which the crosstalk occurs and the subscriber listening. Every six miles equivalent of standard cable which acts in this way on the crosstalk decreases the latter by approximately one-half.

As the volume of sound actually overheard between circuits having a given value of crosstalk to each other depends on the loudness with which the subscribers are talking and the efficiency of the substation apparatus, it is evident that any improvement of substation apparatus which tends to put a larger volume of tone on the line or which renders the receiving apparatus more sensitive will mean that smaller maximum values of crosstalk are permissible between circuits than when less efficient apparatus is employed. Since every effort is being made to improve the efficiency of the transmitter and receiver, correspondingly great efforts should be made to keep the crosstalk in all parts of the plant as low as possible and the maximum limits noted above should in no case be considered as satisfactory if the crosstalk can be reduced to a lower value by a reasonable expenditure of money.

A correctness-of-loading test sets as shown in the figure diagrams is a very necessary testing equipment in determining the efficiency of loading either aerial or underground duplex cable. Dr. Pupin as the inventor of loading coils has always been able to demonstrate mathematically and most accurately the specific loading of any gauge of aerial or cable wires. His invention determined the loading of wires in telephonic wave-length miles.

The measurement of crosstalk is necessary because it can not be calculated mathematically. It depends on so many uncertain quantities that it can not be based on any law of mathematics known or unknown. Crosstalk is inversely proportional to the impedance of the testing circuit. It is therefore necessary to have an im-

pedance testing set in determining the accuracy of mathematical results in locating loading coils. Fortunately for the successful operation of loading coils, their presence on a circuit, increases the sensitive noise tests that are made on a duplex circuit. So much so that it is possible with a correctness set by means of impedance percentages to determine in less than one-eighth of a mile the accuracy of the loading in any given aerial or cable duplex loaded circuit.

The principle and operation of a correctness-of-loading test set is very similar to an unbalance capacity test set, the principal exception being that resistance instead of capacity is introduced to obtain a balance of a difference of percentages.

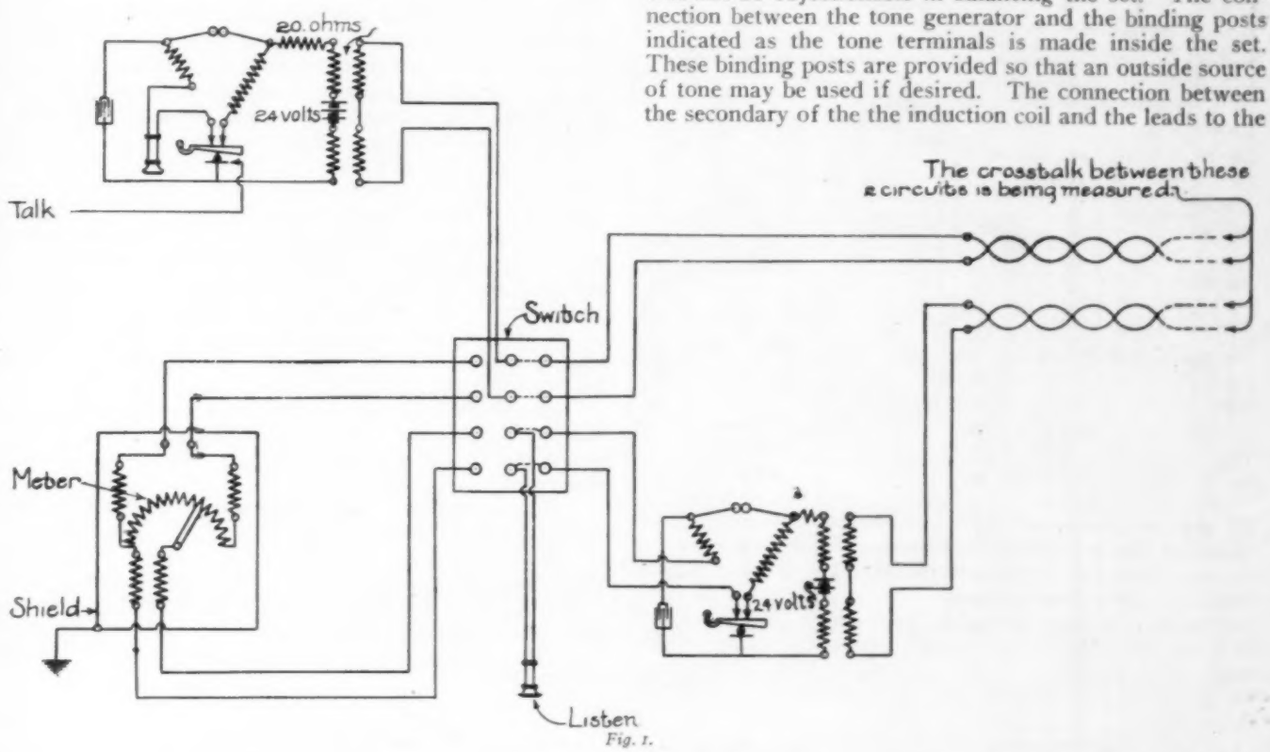


Fig. 1.

In the one case the reading is in fractions of ohms and in the other the reading is in micro-microfarads.

The arrangement of the parts of the correctness-of-loading testing set is shown by the drawing Fig. 1 and the connections are given on Fig. 2.

The set contains the following parts:

1. A 50 ohm circular slide wire resistance with two 100 ohm extension coils and a small double pole single-throw switch for cutting these extension coils in and out of circuit.

2. A switching device, consisting of two double way keys and two single way keys.

3. A tone generator, consisting of an induction coil with an interrupter, three dry batteries and a battery switch.

Slide Wire and Extension Coils: The circular slide wire resistance, the two 100 ohm extension coils and the switch are all mounted on a hard rubber plate. The total resistance of the slide wire, 50 ohms, is to be adjusted to 1/5 of one percent and that of the 100 ohm coils to 1/10 of one per cent.

Tone Generator: The tone generator consists of an induction coil equipped with a current interrupter, three dry cells, and a switch for the battery circuit. A high resistance made of three single resistances in series is connected across the secondary terminals of the induction coil to prevent any excessive rise of voltage.

The parts are assembled and mounted in a box as shown by Fig. 2. This box is made of ⅝ inch oak and provided with a leather handle for carrying. The cover is hinged and fitted with clasps.

The tone generator is enclosed as shown, in a separate compartment of ⅜ inch wood. This compartment is padded inside so that the noise caused by the interrupter will not be objectionable in balancing the set. The connection between the tone generator and the binding posts indicated as the tone terminals is made inside the set. These binding posts are provided so that an outside source of tone may be used if desired. The connection between the secondary of the the induction coil and the leads to the tone terminals is made by binding posts mounted in the tone generator compartment.

Four binding posts are mounted at each end of the hard rubber plate. These binding posts are used to connect the wires to be tested to the set and are to be marked as indicated on Fig. 1-A. The receiver and tone terminals are also marked as shown. The double pole single-throw switch is marked so as to show which scale is to be used for the two positions of the switch.

A dial is mounted on the hard rubber plate to indicate the position of the movable contact on the slide wire resistance. This dial has an outside diameter of 4 inches.

The dial is provided with two scales as shown on Fig. 3, the zero so placed that when the pointer is in that position it will be toward the tester. These scales read in both direction from zero, the divisions to the right of the zero black, those to the left red. The scales show the per cent unbalance and are divided using the curves on Fig. 4. The smallest divisions of the outer scale are one per cent, those of the inner scale five per cent. The accuracy of the divisions is 1/10 of one ohm. The calibration is made with an alternating current of about 120 cycles. The connections should be adjusted so that with nothing connected to the set, the balance should be obtained with the pointer on zero, with extension coils in or out and using either direct or alternating current.

It is the practice to test the lengths of cable between

loading points before the loading coils are spliced in. One of the reasons for this is that the loading splices are the most difficult and troublesome splices to open and handle owing to the fact that two quite different sizes of wire are there spliced together.

The tests that are applied to the several lengths are

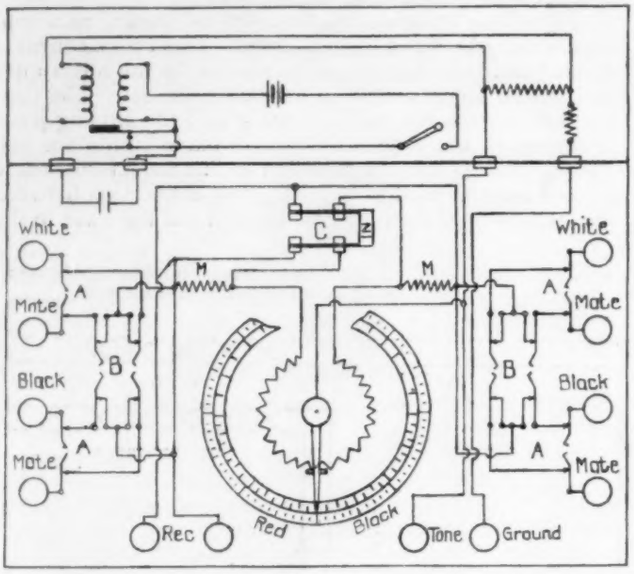


Fig. 1A.

the same as those that are applied to much longer lengths of cables that are not to be loaded. These tests are:

1. *Test for Insulation Resistance:* The apparatus used in this test consists of a D'Arsonval galvanometer of the portable type with shunt, a 48 volt 50 cell battery and a high resistance equal to one tenth of a megohm. The constant is first determined; this is found to vary generally between 30,000 and 60,000 divisions.

Then the insulation resistance between wires of a pair and between separate wires and the rest grounded is obtained by comparing the deflection with the constant. provided all precautions have been taken to guard against moisture in the splices, the resistance may run for over 15,000 megohms—ordinarily it lies between 10,000 and 15,000 megohms per mile.

2. *Test for Grounds, Escapes, Opens, Short Circuits, Crosses and "Splits":* The second test applied to the wires of the cable is known as the balance test and is employed at this point to determine the pairs of wires that are for any reason defective.

Fig. 1 shows the arrangement of the apparatus used. The wires of any pair are connected to the terminals *KK'* of the receiver. If there is no "trouble" of any kind in a pair the sound in the receiver will be zero or faint. An experienced tester can often tell the kind of "trouble" in the pair by the tone in the receiver.

All the pairs that are suspected to contain trouble are tagged and various tests applied in order to determine the nature of the trouble.

If a test shows that one of the wires of a pair is grounded the Murray loop method is employed to locate the ground. If the trouble is found to be a partial ground or an "escape," the same method is applied. This often fails to locate the trouble, especially when the resistance of the leak exceeds 100,000 ohms. In such cases the trouble can only be located by considering all the circumstances attending the installation and splicing up of the length and opening various splices and thus "cornering" the trouble.

If one wire of a pair is found to be open, the distance of the open from one end may be located by the ordinary capacity test for an open wire. The bridge method is used for locating this trouble. The location is made from each end and the average of the results taken.

A short circuit is understood to mean a cross between two wires of a pair. The point at which this trouble occurs is located by means of the Murray loop test.

A cross between any wire of a pair and another of another pair is located by means of the Murray loop test.

A "split" is a trouble that occurs when each wire of any pair is spliced to a wire of two different pairs. It is trouble that seldom occurs and does not produce a very marked tone in the receiver.

An open could escape detection by the balance test when it occurs near the distant end of the section.

After several lengths of cable have been tested and cleared of existing trouble the loading coils are spliced in at the intermediate manholes and the balance test is repeated on the section. Existing troubles are located and cleared. In addition to those mentioned above, most of which occur at the loading manholes, such defects as reversed split, omitted coils may be detected. Troubles of this kind are cornered by an elimination process.

In the double wire test the current passes around the cores of the loading coils in opposite directions. This reduces the inductance effect of the individual coils to a minimum.

The single wire test is the one best adapted for picking magnetized coils.

The tests can be successfully made by any good plant line tests. The following tests can also be made by a thoroughly experienced tester. They depend, however, on a very sensitive sense of hearing, as it will be noted that the important tests are for locating the faults in the

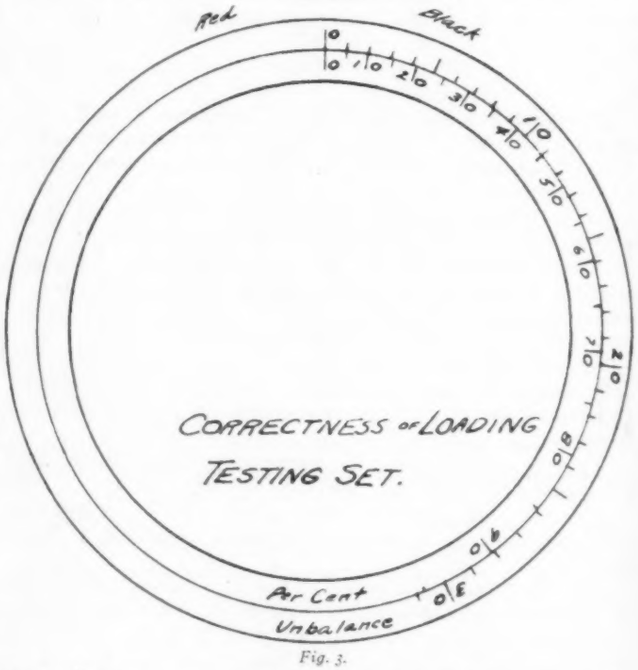


Fig. 3.

loading coils. In calculating fractional tenths as a division of 50 ohms as a total it will be clear that an impedance balance test of a noisy field requires a very patient operator having a very sensitive sense of hearing.

The first step is to ground the conductors and sheath at the distant end. A pair of loaded conductors is then selected as a standard and connected to the terminals, 1, 2 of the bridge and some other pair to the terminals 3, 4. The tone in the receiver is then recorded as some fraction—in tenths—of that heard when either is disconnected from the bridge. This test is called the double wire balance test.

The above process is then repeated, balancing one wire of the standard pair against either wire of the other pair and the tone is recorded as some fraction of that heard in the receiver when either wire is disconnected from the bridge. This test is known as the single wire balance test.

After each pair has been compared with the standard another pair which seems to be free from trouble is selected as a standard and the comparisons repeated.

Those pairs that give results in excess of .2 are again compared with another standard and perhaps among themselves.

This method detects the following defects:

1. Imperfect ground of one or both wires of a pair at distant end.
2. Ground or escape (low insulation) in cable sheath or loading case between ends of section.
3. Open in cable or coil.
4. Cross or short circuits.
5. High resistance at splices.
6. Mixing of different size wires in composite cable.
7. Omitted coil.

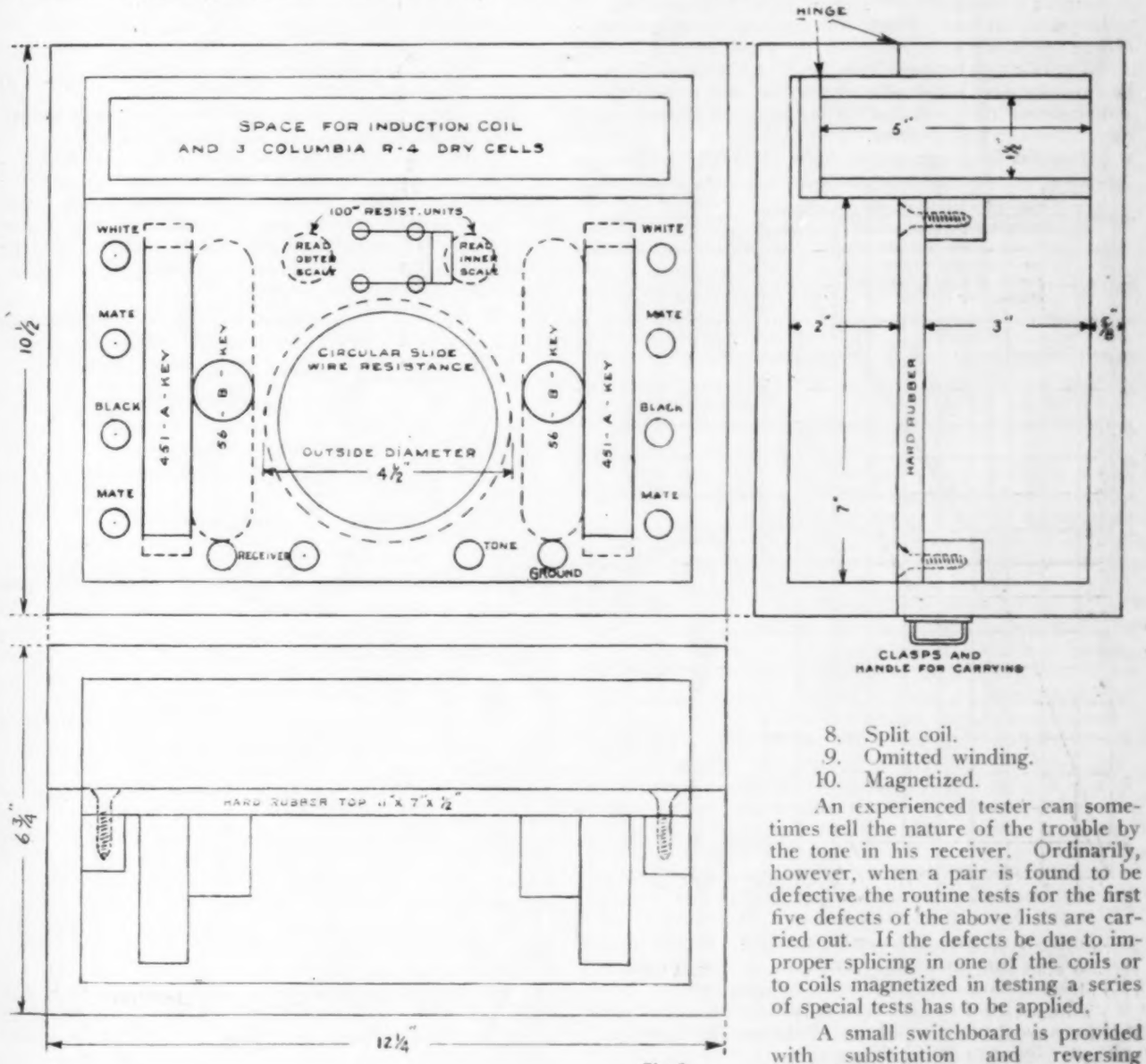


Fig. 2.

8. Split coil.
9. Omitted winding.
10. Magnetized.

An experienced tester can sometimes tell the nature of the trouble by the tone in his receiver. Ordinarily, however, when a pair is found to be defective the routine tests for the first five defects of the above lists are carried out. If the defects be due to improper splicing in one of the coils or to coils magnetized in testing a series of special tests has to be applied.

A small switchboard is provided with substitution and reversing switches, two loading coils, a ground connection and a pair of binding posts to which the standard pair may be connected. An additional loading coil with a ground connection is also provided.

This apparatus is taken to the distant end of the cable section; the ground is removed and the ends of the standard pair are connected to the terminals *A, A'*.

An attempt is then made to get a balance between the defective pair and the standard pair by introducing into the latter defective coils.

Magnetized coils are the most difficult to locate. They are slightly low in inductance and can generally be located only by a cornering process.

FIELD TESTING OF LOADING COIL CASES AND DUPLEX PHANTOM CABLE.

In outlining the object, importance and efficient results obtained in the field testing of loading coils and duplex phantom cable, it is essential as a matter of clearness to tabulate the results of all of the tests under a stipulated condition. It is only by so doing that a comprehensive idea may be obtained in a discussion of so technical a subject. From transmission, crosstalk, and Morse operative tests made on an experimental loaded aerial installation between Pittsburgh and Newton Square, Pa., results were obtained that may be said to be typical and represent the general efficiency of aerial loaded phantom circuits in this country.

The No. 12 gauge wires of the Philadelphia-Chicago

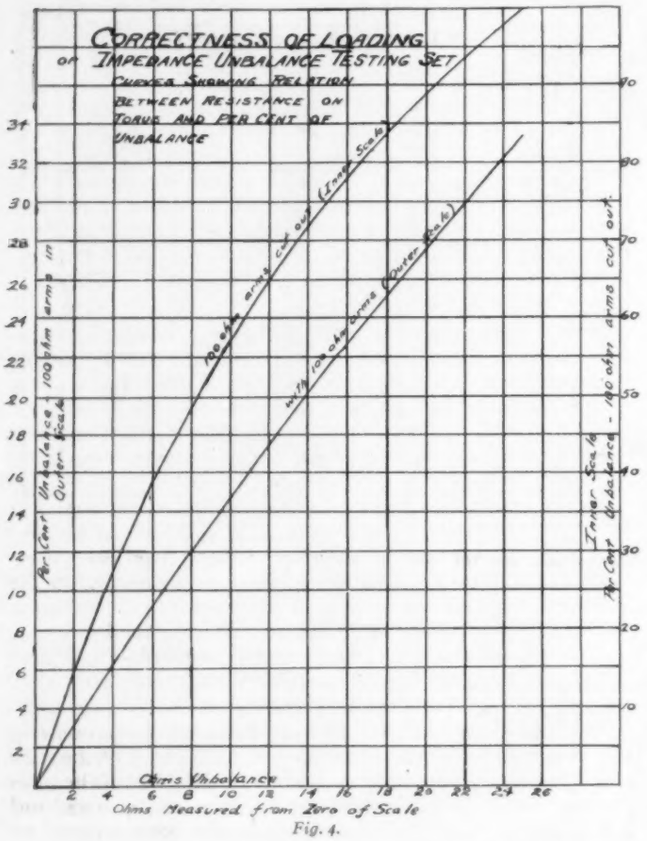

CORRECTNESS OF LOADING
ON IMPEDANCE UNBALANCE TESTING SET
CURVES SHOWING RELATION
BETWEEN RESISTANCE ON
TORUS AND PER CENT OF
UNBALANCE
Per Cent Unbalance Outer Scale
Per Cent Unbalance - 100 ohm arms in
Per Cent Unbalance - 100 ohm arms cut out (Inner Scale)
Inner Scale
Ohms Unbalance
Ohms Measured from Zero of Scale

Fig. 4.

it was approximately four miles. The coils at each loaded section consisted of one aerial phantom circuit coil and two physical or aerial side circuit phantom coils.

Transmission Tests:—All the transmission tests made line were used for the purpose. The general spacing of the coils was eight miles, except at the end sections where were "loop" tests; that is, the circuit under test began and ended in the same office (Brushton test station), and its equivalent was obtained by a direct comparison to artificial cable. In looping the different loaded circuits of the same type together care was used to maintain uniform loading at the looping point. Standard common battery instruments with standard toroidal repeating coils and 24 volt battery were used in all transmission tests.

It should be noted, too, that the insulation of the circuits during all of the tests was considerably in excess of ten megohms per mile, and the circuits were normal as to resistance.

RESULTS OF TRANSMISSION TESTS.

Brushton to Newtown Square and Return Trunk Loop				Equivalent in Terms of Miles of No. 19 Gauge .06 Mf. Cable For 3 Mile Subscribers' Loops	For 0 Mile Subscribers' Loops
Circuit	(1– 2)	+ Ckt	(3– 4)	19.6	25.1
"	(1– 2)	+ "	(7– 8)*	20.6	25.5
"	(3– 4)	+ "	(7– 8)*	20.5	25.7
"	(1– 2)	+ "	(7– 8)*	20.8	...
"	(3– 4)	+ "	(7– 8)*	20.9	...
"	(1– 2)	+ "	(9–10)*	20.4	...
"	(7–8)*	+ "	(9–10)*	21.4	...
Phantom	(1– 4)	+ "	(25–26)†	16	19.2
"	(1– 4)	+ "	(27–28)†	17.3	20.4
Circuit	(25–26)	+ "	(27–28)	17.2	18.9
Phantom	(1– 4)	+ "	(25–26)†	15.9	...
"	(1– 4)	+ "	(27–28)†	16.4	...
Circuit	(25–26)	+ "	(27–28)	16.7	...

*NOTE—Circuits 7–8 and 9–10 are other loaded No. 12 gauge circuits.
†NOTE—Circuits (25–26) and (27–28) are non-loaded No. 8's.
Distance—Brushton to Newtown Square, 277.0 miles.

In the tests on the loaded side circuits 1-2 and 3-4, other loaded No. 12 gauge circuits were used in conjunction with the loaded side circuits, as shown in the above results, in order to obtain enough trunk loop equivalents from which to determine the circuit equivalent of each circuit. Thus, by solving the several equations the following circuit values were obtained:

Brushton to Newtown Square, 277 Miles.
Equivalent in Terms of Miles of No. 19 Gauge .06 Mf. Cable.

	For 3 Mile Subscribers' Loop at One End; No Reflection Loss at Other End.		For 0 Mile Subscribers' Loop at One End; No Reflection Loss at Other End.
Circuit	Test of 10/15	Test of 10/16	
1– 2	9.8	9.9	12.5
3– 4	9.8	10.0	12.6
7– 8	10.8	10.9	13.1
9–10	...	10.5	...

(To be concluded.)

High Resistance Railroad Telephones

At a meeting of the Western Division of the Association of Railway Telegraph Superintendents, E. C. Keenan, of the New York Central lines, in speaking on the use of telephone developments in railway service, referred particularly to the recent trial on the Cleveland, Cincinnati, Chicago & St. Louis of high resistance receivers on telephone despatching circuits to improve the transmission. This development grew out of the unusual conditions existing during recent months under the very heavy movement of traffic. On the 100-mile division on one day there was a freight train on every siding at the same time and every operator was naturally listening in on the despatcher's line in an attempt to keep the trains moving. This, of course, resulted in weakening the transmission so that the despatcher was very much hindered, and complaint was made. Tests showed that with the way stations cut out, the transmission was normal, and the idea was therefore conceived of using a high voltage receiver at these stations to minimize the effect of leaving the receiver off the hook. Standard receivers used in wireless telephony were secured, these being of the double type, with 1,500 ohms in each receiver, making 3,000 ohms across the line. The installation of these receivers in the 30 stations on this 100-mile circuit improved the transmission so much that it could be classed as good from end to end. Some laboratory tests were then undertaken with these receivers, and it was found that one 1,500-ohm receiver, with a choke coil in series, gave equally good results, and the remaining receivers were, therefore, taken off and used on other circuits.

European Telephone Development

Translations from the Foreign Press and Communications from European Engineers

BY FRED W. SCHOLZ

M. BARBARAT, director of the postal, telephone and telegraph department in Tunis, installs eight parties on the same party line and makes the operation of this system a complete success. In realtity there are eight subscribers and one pay station connected to this line and the distance from the exchange to the most distant subscriber is over 20 miles. The description of this installation is rather interesting from numerous standpoints.

General Requirements: Several subscribers can be connected to one party line by connecting them in shunt on the circuit and by arranging that the calls to the different subscribers be differentiated by a number of shorter or longer rings. Privacy of communication is not assured, however, and the fact that a line is busy is not indicated by any visible signal. This very simple system is employed in many countries. An installation to be really useful, and as nearly perfect as is possible, must give the caller an individual call signal, an indication that a line is busy, privacy of conversation and locking out of the uncalled subscribers' stations. The installation described here follows out all of these points with the common telephone equipment on hand at every station.

Calling Subscribers from the Exchange: The individual call to the subscribers from the operator at the exchange is sent out by current, either positive or negative, transmitted over one or two wires, which are either in parallel or in series. These currents are received in polarized relays, which cause the closing of the alarm bell circuits at the various stations. These relays are permanently shunted on the common party wire. Their self induction, which is considerable, helps to eliminate losses in telephone current.

The following eight combinations of calls can be sent: Four for calls on a single wire; four for calls over two wires. The wires are grounded at the eight stations right behind the calling relays. These wires are numbered 1 to 8 and the stations being designed by the letters A, B, C, D, E, F, G, H, the combination will be as follows:

	1st group. Call over one wire.	*2nd. group. Call over two wires.*
Through body of plug.....	A — 1	E — 1 — 2 like AB
	B — 2	F + 2 + 1 like CD
Through end of plug.....	C + 2	G — 1 + 2 like AC
	D + 1	H — 2 + 1 like BD

When the call is made on a single wire (1st group), the subscriber's station has only a polarized relay connected to this call wire, but to the second wire a non-polarized relay with a back contact is connected, which operates when a subscriber of the second group is called over two wires. The local bell call signal is established through the back contact of this relay and the working contact of the calling relay; this circuit will therefore be found to be broken for all calls over two wires. When the call is made over two wires (2d group), the two relays are polarized and the local bell circuit passes through the two working contacts. It is clearly seen that one can send individual calls by sending the currents indicated in the wiring diagram and the table and by placing the polarized relays in the proper places.

The call currents are sent out by means of a plug and cord containing the proper keys and two jacks with reversed wires. For the stations *G* and *H* a call is made over metallic circuits, the battery not being grounded. The circuit of the call cord contains the relay which gives the final signal, showing that the conversaion is ended. Another plug is used to make connection with outside lines. It is cut in over the two wires by means of condensers.

Call of Exchange by Subscribers: At the exchange switchboard each wire is provided with two annunciators, shunted and polarized in an inverse direction, with the terminals grounded, making four call annunciators. The subscribers of the 1st group call the exchange operator over a single wire with a magneto, with direct current, of the same direction as the current of the battery which is used for the calling signal. Consequently only that polarized annunciator disc drops which corresponds to that of the calling subscriber and it is likewise clear that the other subscribers are not disturbed, the calling current passing towards the exchange, being of the same direction and over the same wire as that of the call passing towards the subscriber.

The subscribers of the 2d group likewise make their call through a magneto with direct current, acting in the proper direction over the two wires, conforming to the combinations given above. Each call is characterized by the fall of two annunciator discs at the exchange switchboard, as the table shows: i. e., the annunciator discs *A* and *B* for a call from *E; CD* for *F; AG* for *G; B* and *D* for *H*. We might repeat that the other subscribers are not disturbed, as was shown before.

Busy Signal and Locking of Other Stations: The "busy wire" signal remains in view permanently in all the other stations while one of the parties carries on a conversation. To obtain this end, each subscriber's station is provided with calling relays, non-polarized, giving a "busy" signal, which remains closed at all the other stations during the length of conversation.

At the stations called over a single wire, i. e., having but one polarized calling relay, it is only necessary to place a "busy" signal relay on that one wire. The non polarized relay placed on the other wire has a back and a working contact. It makes use of the back contact of the cut-off relay of the local calling circuit, when calling over two wires. Its working contact is used to give the "busy" signal. A coresponding resistance is added to balance the "busy" signal relay placed on the first wire.

The "busy" signal operates on all the stations either when the exchange calls a subscriber, or when a subscriber calls the exchange. In this last case, however, his own signal works only, when the exchange sends a call current in order to close the connecting relay, which is here discussed.

At the close of each conversation, a current is sent out from the exchange, as will be seen later on, to disconnect the telephone apparatus in order to assure secret of conversation. This current, called the disconnecting current, returns to rest position all the "busy" signals of all the other stations.

The operation of the "busy" signal disconnects earth

from the calling magneto for the subscribers called through earth, or else the circuit of the magneto, when the call has come over a metallic circuit. The stations that are not connected cannot then trouble conversations by using their calling magnetos.

Privacy of Conversation: Privacy of conversation is obtained by keeping the telephone apparatus insulated from its circuit at rest, and connecting it to the circuit only at the very moment of conversation. This effect is obtained by means of a connecting relay with two discs, operating when the exchange operator sends a call current and remaining closed when the calling current ceases. When central responds to the call of a subscriber, a calling button must be pressed down to make this connection. It is an additional act which must not be forgotten, for without this, conversation cannot take place with the subscriber.

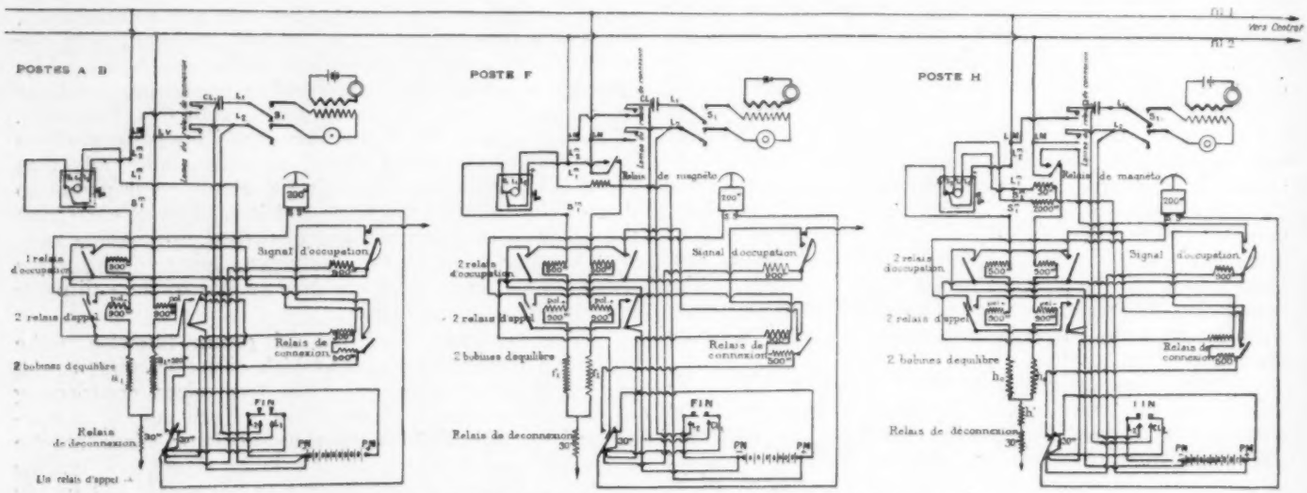


Fig. 1. Detailed Wiring Diagram for Eight Subscriber Party-Lines.

Disconnecting Calls and Removing "Busy" Signal: It is necessary to disconnect the telephone sets of the station which has just talked and to let the "busy" signal discs return to open wire at all the stations. This action also is indispensable as without it the subscribers cannot call central. This is done by means of a non-polarized relay, called the disconnecting relay, placed at each station and grounded, right behind the junction of the two wires and acting under the influence of currents sent out in parallel. This relay, provided with two working contacts, shunts the local circuits of the connecting relay and the "busy" signal relay and consequently sets them at rest. A resistance is placed between the back stop and the disc. The operator at the exchange makes all the disconnecting relays operate when she presses on a button with double segments, sending positive current in parallel over the two wires of the telephone line. The relays used for disconnecting at each station are regulated in such a way as not to operate under the influence of call currents sent out in parallel over the two wires corresponding to the combinations *F* and *E*.

Disconnecting Control: Sending out disconnecting current frees the wires. This is absolutely necessary, as without it the stations cannot be called. To this end the exchange switchboard has been provided with an arrangement called "Disconnecting Control," which will ring a bell when the operator withdraws her plug if she has forgotten to give the disconnecting signal. The bell sounding circuit of this control system passes through some suplementary segments of jacks, when the plug marked "call" is placed into one of the jacks and this circuit is broken, when the plug is withdrawn.

This circuit is formed by means of a relay called "disconnecting control," which operates and remains locked every time one presses down on one of the call buttons. It is broken when one presses on the disconnecting button, since the control relay has just returned to the rest position through the breaking of the locking circuit.

Consequently, when the operator sends a call current, it makes the control relay operate, which remains locked during the entire length of conversation. The control bell, which is at the same time that used for calling, does not work, since the circuit is broken by the springs of one of the calling jacks. But when the operator withdraws the plug, if she has forgotten to give the disconnecting signal, the circuit will be closed by the springs of the jack returning to the rest position and the bell will sound, until the control relay has been returned to the rest position in pressing down on the disconnecting button.

End-of-Conversation Button: An "end-of-conversation" button has been added, which is used only when the subscribers' stations are connected. Then it sends the current from the local battery of the station into the final-signal relay at the exchange and it is this relay which operates the annunciator disc, announcing the end of the conversation. This end-of-call signal can only be given by a connected station. The other stations cannot interfere with communications by pressing on their final conversation buttons.

At each station the telephone set is connected into the circuit by means of segments of the connecting relays. One has cut in one of the wires by use of a condenser. If one of the subscribers who has just spoken has forgotten to hang up his receiver, the two wires would be connected by the telephone circuit and the calls of the subscribers would be interfered with if this were not done.

Details of the Installation: At each subscriber's station we have the call circuit, the telephone circuit and the local bell circuits, the disconnecting and the "busy-wire" circuits. All of these are shown in detail in the wiring diagram.

Call Circuit: Starting out from the two terminals of the line *LM-LN*, the call circuit passes symmetrically over each wire. To the left, we have on the side of *LM*

(*M* stands for magneto), the magneto with redressed current, a "busy" relay of 500w, a polarized relay of 900w with working contact and balancing coil. On the right, the *LN* side, we have the same disposition, except that there is no magneto and that the calling relay is not polarized with the back contact for the stations of the first group *ABCD* but is polarized with the working contact for the stations of the second group *EFGH*.

As was said before, at the stations *ABCD*, the "busy" relay of 500w on the side of *LN* is suppressed and to re-establish a balance, there is added a 500w coil on the side of *LN*. It is the non-polarized relay of these stations, which by means of its working contacts, forms the "busy-wire" circuit, when one calls a station over wire *LN*. At all the stations one will find the disconnecting relay of 30w and the ground connection behind the junction of the wires of the station.

Telephone Conversation Circuit: The telephone circuit uses two shunt wires, starting out from the terminals *LM* and *LN*. These wires are normally cut in

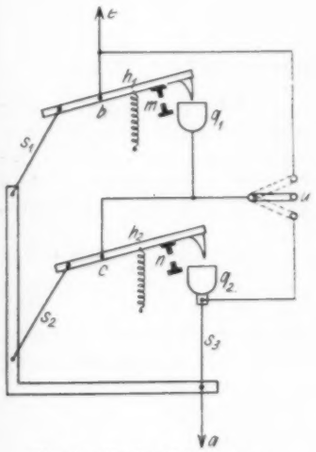


Fig. 3. Yrwha Safety Fuse.

by the segments of the connecting relay, since they connect to the terminals L_1L_2 of the telephone set, the wire L_1 being cut in by a condenser *2*.

Local Bell Circuit: The local bell circuit starting out from a terminal of the local battery passes through the back contact and the segment of the disconnecting relay across the bell system of 200w and ends then in one of the working contacts of the polarized call relays of *LM*. It passes through the back contact or the working contact of the second call relay of wire *LN* to end in the other pole of the battery.

Local Circuit of Connecting Relay: The principal coil of the connecting relay is joined on the one side to a pole of the local battery and the back contact of the disconnecting or cut-off relay; on the other side, to the second working contact of the polarized relay. The connecting circuit is the same then as the bell circuit. It closes at the same time as the latter, but when the call relay returns to the rest position, cutting the bell and the connecting circuits, the connecting relay remains locked. This result is obtained by means of a second connected coil, which at the same time reduces the intensity of the locking current. These two coils are shunted over the disconnecting relay at the moment it operates.

Local Circuit of "Busy" Signal: The local "busy" signal circuit passes through the working contacts of the "busy" relays or the non-polarized relays on the side of wire *LN* and, in general, agrees with the connecting circuit and consequently is shunted as that passing over the disconnecting relay at the moment of operation.

Operation: At the moment of calling, the bell sounds, the connecting relay locks, as also the "busy" signal. If it is a station which is not to be called, neither the bell nor the connecting relay operate, but the "busy" signal locks at all the stations.

Final Button: The final button sends current from the battery over the two wires through the termnials of *LM-LN* into the supervisor relay at the exchanges, provided the station is connected.

Magneto: The magneto with commutated current is always on the left side of wire *LM*. For a call sent to the exchange, from the stations of the first group, i. e., over a singel wire, it is only necessary to connect the call wire to the terminal *LM*.

Relay of Magneto: For a call of the stations of the second group, i. e., over two wires, a special arrangement is needed to introduce the second wire *LN* into the call

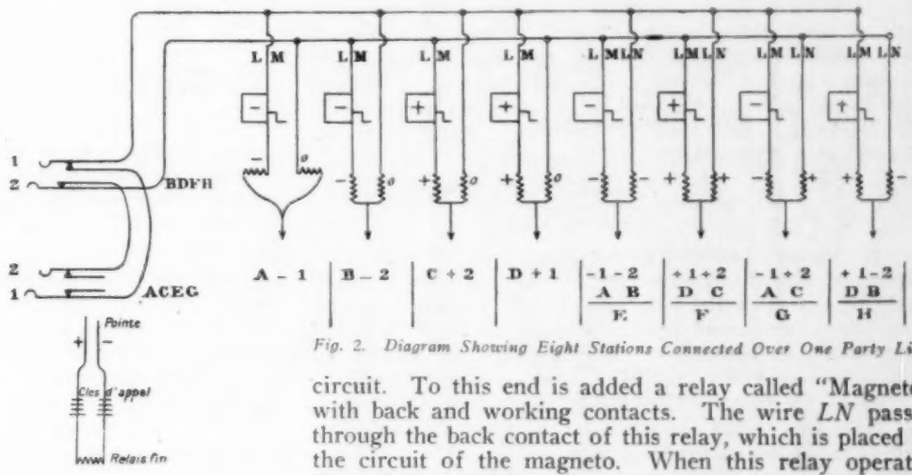


Fig. 2. Diagram Showing Eight Stations Connected Over One Party Line.

circuit. To this end is added a relay called "Magneto" with back and working contacts. The wire *LN* passes through the back contact of this relay, which is placed in the circuit of the magneto. When this relay operates through its working contact, it places the wire *LN* in parallel with the wire *LM* for the stations *E* and *F* or in series with the other stations, *G* and *H*. A portion of this relay cuts off the connections of the relays on the side of *LN;* it is therefore only the action of the "busy" signal which appears at the station that is making the call; this precaution is needed, as the action of the "busy-signal" would paralyze the magneto.

Locking of Uncalled Stations: As was said before, the "end of conversation" button can send current only if the connecting relay has operated, the wires being connected to the working contacts of this relay. The uncalled stations can therefore not give the end signal and interrupt communication between other stations by pressing on their buttons. The operation of the "busy" signal at all the stations disconnects earth from the magneto when the call uses the ground circuit or else cuts off the circuit from the magneto, when the call is made over a magnetic circuit. One uses a "busy" signal with back and working contacts. In these signals in contrast to the ordinary relays, the two back and working segments are in contact when at rest and are separated at the moment when the working contact is touched, leaving the back segment insulated. The magneto is connected to the working segment and the back segment is grounded for those six stations *ABCDEF*, that are called by ground circuits or else is connected to one of the poles of the local battery for the stations *G* and *H* called over metallic circuits. When the operator, in pressing down

her call button, thus has locked all the "busy wire" signals, all the stations have their magnetos paralyzed through cutting off the terminals.

Addition of Local Battery to Calling Magneto: Stations E and F. For calls over two wires one chooses as far as possible calls from stations near the exchange. A local battery is added to the magneto. The terminal of the relay of the magneto is connected to the pole of the local battery, which is in the same direction as the calling magneto. The other pole is grounded by the back contact of the "busy" signal. During a conversation the busy signals have been given, however, and the earth is cut off from the local battery.

Stations G and H. Choosing for *G* and *H* stations near the exchange, there also is added a local battery to the magneto for these two stations. This battery is connected between the magneto and the working contact of the relay, which is found to be connected to the second wire when the relay operates. During a conversation, the pole of the battery connecting to the wire *LN* is cut off. If this cutting off were not brought about, the other pole of the battery passing to *LM* across a condenser, there would be a shunting of the telephone circuits. The diagram Fig. 2 shows the entire system of eight stations with the location of the call relays and the magnetos.—M. Barbarat, Dept. of Telephones, Tunis, Africa. *Annales des Telegraphes et Telephones.*

YRWHA SAFETY FUSES

If a safety fuse has blown out through a temporary excess of current, the electric system can be repaired again by replacing the destroyed fuse by a new one. If, however, a permanent fault is present, the new fuse will immediately be blown out. Consequently the fault must first be located and remedied. Cases of the first kind are the more frequent. The safety fuse here illustrated, Fig. 3, is to prevent the loss of time needed to install a new fuse through automatic action.

The current enters at *e* and reaches the safety fuse s_1 by way of the point of rotation *b* of the lever h_1. This wire closes the path to the outgoing terminal *a* of the current. If the wire s_1 is burned out, the lever h_1 under the influence of a spiral spring closes the mercury contact q_1 and offers a new path for the current, using the safety fuse wire s_2. If this should burn through, the entire action is repeated and the wire s_3 is brought into the circuit. The contacts *m* and *n* can be used to announce the operation of the safety fuses by means of either visible lamp or audible bell signals. The switch *u* is used to bridge the safety fuses s_1 or s_2 in order to change the fuse wires. If there is a permanent short circuit wire s_3 will also blow out. By giving to wires s_1 s_2 and s_3 different strength and therefore different fusibility, the apparatus can be used to indicate the strength of the current which was present when the fuse wire blew out.—*La Lumiere Electrique.*

DAMAGE CAUSED BY STORM

Perhaps one of the worst storms of the year struck the British Isles in March of last year. It destroyed practically all the overhead telegraph and telephone lines in the region running from Humber to Pembroke and from Wash to Bristol. 2150 poles were snapped off. 6050 poles were uprooted. 33,300 poles were damaged. The number of poles that had to be replaced was therefore near 41,500. The poles belonging to the railways are not included as they are not under the British Post Office department, which also runs the telephone system. The length of copper wire that was snapped into small sections represents some 27,000 km, about 16,000 miles. The weight of this wire which had to be restrung was 1500 tons. Normally there would have been on hand a repair force of 20,000 employees, but 11,000 of these are in the war at the front. As a matter of fact, the best of them and the most experienced are in France. There remained an effective repair force of 9000 people who had to make these repairs. The tempest was the worst that had ever been known in generations to devastate the country. It was so tremendous that estimates of time needed to make all the repairs went as far as the following Christmas. The only thing that saved England from isolation internally was the fact that many of the telephone lines are laid in underground conduits. This experience has shown the value of underground lines more than ever before and plans are under way to replace all of the aerial lines after the war by underground systems.

Wireless Telephony in the War

The wireless telephone is to be developed in the course of the war, it is announced from Washington. The government plans to use this means of communication between ships at sea and between ships and aeroplanes, as well as between ships and aeroplanes and land stations.

Wireless telephony will not replace wireless telegraphy, but will supplement it. The navy department has been actively engaged in the development of the wireless telephone and reports very satisfactory progress. The department has just issued the following interesting bulletin relative to the subject:

Wireless telephony as well as wireless telegraphy will be used by the United States Navy in its war operations. A year ago, by order of Secretary of the Navy Daniels, telephone officials of the Bell system and Navy officers planned and successfully carried out a three-day mobilization of communication forces during which war conditions were simulated. Instantaneous communication was provided over the wires of the Bell system by both telephone and telegraph from the office of the secretary at Washington to all the naval stations in the continental United States, and wireless telephone communication was maintained between the office of the secretary and an American battleship in the Atlantic Ocean.

Since that time engineers and scientists connected with the Bell system have been working in close co-operation with officials of the Navy Department and have developed further use of the wireless telephone in the naval service. The plans followed in the original mobilization have proven in practical operation to be as highly satisfactory as they were at that time.

The telephone and telegraph engineers, whose organizations are all represented on the telegraph and telephone committee of the Council of National Defense, have also been working with the Army and naval officials, the National Research Council and the Naval Consulting Board on many research problems of vital importance to national defense, such as telephone communication with aeroplanes new wireless methods, and apparatus for detecting the presence of submarines and important progress has been made.

Telephone Patents Issued Recently

A Brief Digest of those Current Specifications Most Interesting to Telephone Men

BY DAVID S. HULFISH

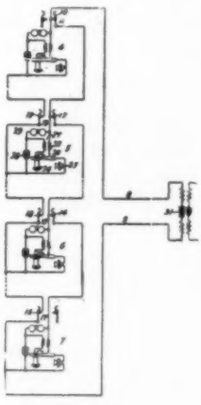
NO. 1,221,030. Operating System. Issued to H. D. Currier, assignor to Kellogg Switchboard and Supply Company, Chicago, Ill. An operator has cord pairs for connecting a calling telephone to another telephone or over a trunk to a distant switchboard. The order-wire key for the trunk uses the speaking conductors of the trunk and cuts off the calling telephone while the operator uses the trunk as an order-wire circuit.

1,221,124. Automatic Switch Release System. Issued to S. B. Williams, Jr., assignor to Western Electric Company, Inc., New York, N. Y. In an automatic exchange equipped with loop-circuit callsender, a slow relay receives numerical signal impulses and effects changeover at the end of the numerical signal. A slow relay for release receives impulses from the first slow relay but does not release the switch for the changeover impulse.

1,221,134. Secrecy System for Party-Line Telephones. Issued to C. C. Bradbury, assignor to Western Electric Company, Inc., New York, N. Y. A two-wire line runs from the telephone switchboard to the nearest telephone, and thence a three-wire line runs from telephone to telephone. At each telephone is a key and the user of the telephone, by changing the key at his telephone while in use, may prevent any other of the telephones upon the same line from overhearing the conversations, since each key opens one wire each way to the remaining telephones of the party line.

1,221,135. Coin Collector. Issued to O. Brisbois, assignor to J. H. Ware, Chicago, Ills. A telephone coin box has two positions for a coin. In the first position the coin closes a circuit to call the central office and is released to pass to its second position when the central office responds.

1,221,140. Telephone Line-Lamp Calling System. Issued to H. P. Clausen, assignor to Western Electric Company, Inc., New York, N. Y. A telephone line is provided with two calling lamps and two answering jacks. When a call is made,



1,221,134.

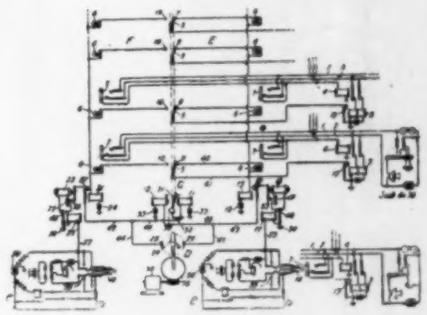
the first or regular line lamp is illuminated and then after a fixed time interval if the call has not been answered by the operator the call is transferred automatically to the second or emergency line lamp before another and presumably less busy operator.

1,221,158. Ringing Circuit for Automatic Exchanges. Issued to B. G. Dunham, assignor to Western Electric Company, Inc., New York, N. Y. At the final connector in an automatic telephone exchange, the circuit for the ringing relay is formed through a back contact point of the test relay so that, if a connected line be busy and thereby charge the test relay, the ringing relay may not be operated.

1,221,166. Automatic Telephone System. Issued to C. L. Goodrum, assignor to Western Electric Company, Inc., New York, N. Y. In an automatic exchange, with two telephones connected for conversation, this improvement provides that a third line may be called into the connection and the three telephones may speak together.

1,221,167. Calling Impulse System for Automatic Exchange. Issued to C. L. Goodrum, assignor to Western Electric Company, Inc., New York, N. Y. Current is supplied to the calling line through a double-wound relay which is in effect a repeating coil. As the calling loop is interrupted by the callsender, induced currents are set up in a local circuit and by a polarized relay these currents are effective in adjusting the selective switches. Thus the operating circuits of the selective switches are controlled only through the inductive link to the line.

1,221,168. Automatic Searching System. Issued to C. L. Goodrum, assignor to Western Electric Company, Inc., New York, N. Y. When an automatic selecting switch has searched over all the lines or trunks of a group, the switch is automatically restored to the position of beginning search and then repeats the search, and so continues until an idle



1,221,140.

trunk is found or until the switch is fully released by the calling telephone.

1,221,169. Restricted Automatic Telephone System. Issued to C. L. Goodrum, assignor to Western Electric Company, Inc., New York, N. Y. Where it is desired (as in a private branch exchange) that certain lines shall not be called automatically unless supervised by an operator, circuits are so arranged that when such a restricted line is called the automatic selection is made but the ringing circuit is not closed; instead, a signal is displayed for the operator who then closes the ringing circuit and records the connection or otherwise supervises it.

Telephone Company Earnings

The figures of earnings of telephone companies in the United States as issued by the Interstate Commerce Commission show that the revenues of these companies continue to show record gains. The net income due to high costs of materials and increased taxes does not show up so favorably, but an increase is reported over the previous year, however. The gross income of all companies was $25,608,000, an increase of $3,434,000 over 1916. Operating expenses amounted to $16,774,000, an increase of $2,513,000. Taxes were $307,000 larger than in the previous year. Income after taxes amounted to $7,167,000, an increase of $638,000.

That Missouri's nine-hour labor law does not protect telephone operators from long hours was revealed when a complaint was made to the state labor bureau. An operator in a small town who said she was compelled to work ten and one-half hours every night filed the complaint.

Los Angeles Merger Settled

Actual consolidation of the Home and Sunset telephone companies in Los Angeles, California, will take place probably within six months, and not later than eight months, according to statements made by officials of both concerns. The long-awaited approval of the Federal government has been received.

To operate the merged companies will require the employment of practically all the persons now working in various capacities, and it is not believed it will be necessary to discharge anyone. Especially is it desired to retain all those in executive positions.

The merger would be consummated immediately were it not for the fact that the United States Government has first call on the copper production of the country. When this restriction is released by the government there will be an abundant supply of copper, and the two companies will operate as one.

Approved by both the Department of Justice and the State Railroad Commission, the merger was recently authorized, the consolidated concern being known as the Southern California Telephone Company, but the consolidation was contingent upon physical construction, and officials say it is improbable that the necessary copper and other material can be secured in less than six months.

The officials of the Southern California Telephone Company will be: A. B. Cass, president; J. C. Nowell, first vice-president; H. D. Pillsbury, second vice-president; C. F. Mason, commercial superintendent.

When the actual consolidation takes place, patrons of both companies will be privileged to call any subscriber, either of the former Home or Sunset company, without extra charge.

According to stipulation, there will be no increase in the charge for extra service for at least five years. At the expiration of that period the Southern California Telephone Company will be privileged to apply to the Railroad Commission for permission to increase its rates.

"It is especially gratifying," said one of the officials, "that the consolidation will not make it necessary to discharge any of the employes of either company. The employes of both concerns, of course, are experts.

"The two concerns are ready and willing for the actual consolidation, but it is impossible to interfere with the government's plans, and we must wait until the supply of materials is released. When it is, and we have been assured it will not be longer than eight months, we will stretch the cables and consummate the deal at the earliest possible moment."

China Wants American Telephones

Difficulty in obtaining telephone supplies from England and other European markets is compelling telephone companies of the Orient to look to the United States for needed material, and to investigate the market opportunities in this country, says Harold S. Bennett, assistant manager of the Hongkong Telephone Company, who arrived in Seattle, May 4, on the Nippon Yusen Kaisha liner Sado Maru.

Bennett after spending two days in Seattle proceeded to Vancouver, B. C., to continue his investigation of the telephone supply conditions.

"My business in America is entirely on telephone matters, and before returning to Hongkong I want to see what there is on the Pacific Coast for our company," said Bennett. "I want to inspect the workings of the Seattle telephone service, of which we have heard a great deal, and it is possible the Hongkong Telephone Company will in time introduce certain changes which will improve our present service.

"The conditions are entirely different in Hongkong from here, and on account of the unusual humidity the year through we operate under a system which, obsolete here, appears fairly well adapted to our requirements. We still employ the old style of hand ringing instruments, but this may in time be changed if the more modern electrical system can be made suitable for our atmospheric conditions.

"I shall also investigate the automatic system before returning, and we are greatly interested in this type of exchange. Another matter, a more important one, will be in the opportunity this country offers for supplying such telephone material as we are constantly in need of and which we have always obtained in England or some other European country."

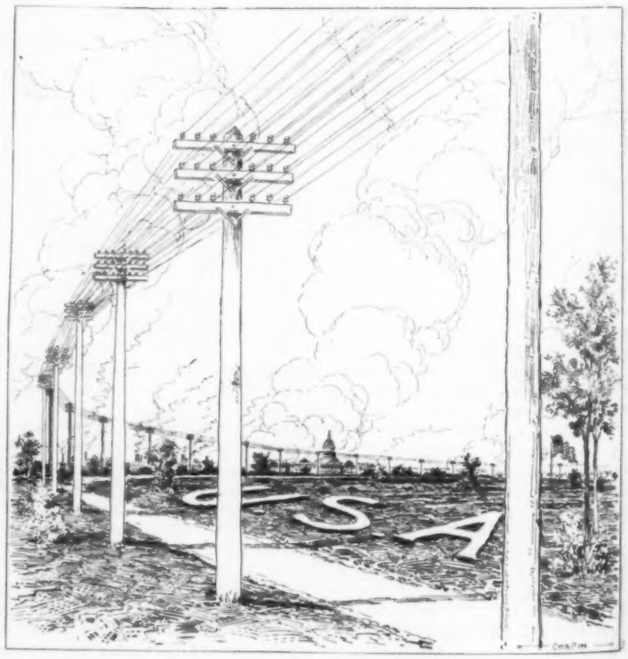
Reel Connected to Engine

A take-up reel, designed by F. M. McNeill, local manager of the Oregon-Washington Telephone Company at Goldendale, Wash., is causing considerable comment.

A three-foot iron rod with universal joints at each end connect the rear wheel of McNeill's Dodge Brothers' touring car to an ordinary take-up reel. The wheel is jacked up and when the clutch is thrown in the wire is taken up at a rate more uniform and rapid than is possible with the hand operated reel. Breaks and sanrls, the bugbear of the old style machines, are unknown.

This is only one of the rapidly increasing uses to which the ingenious owner of today is finding his motor car adaptable.

The Second Line of Defense



Apologies to the Southwestern Telephone News.

Public Utility Commission News

Reports Concerning the Activities of State Regulating Bodies in the Telephone Field

California

A JOINT application authorizing the Southern California Telephone Company to issue to the Pacific Telephone and Telegraph Company $786,000 capital stock and requesting approval of $355,000 in bonds acquired by the Home Telegraph and Telephone Company from the Southern company and the permission for the Pacific company to acquire $786,000 in stock from the Southern company, has been filed by all three companies with the state railroad commission.

The Southern California Telephone Company has been formed for the purpose of absorbing both the Home and Pacific companies. The merging of the two latter companies was sanctioned by the commission several months ago.

Colorado.

Amendments to the Public Utilities Act of the State of Colorado provide:

Section 29. (Amended. Approved April 16, 1917; effective April 16, 1917.)—The commission shall have power, after hearing had on its own motion or upon complaint, to make general or special orders, rules or regulations or otherwise to require each public utility to maintain and operate its line, plant, system, equipment, apparatus, tracks and premises in such manner as to promote and safeguard the health and safety of its employes, passengers, customers and the public and to require the performance of any other act which the health or safety of its employes, passengers, customers or the public may demand.

Section 35. (New section. Approved April 16, 1917; effective July 16, 1917. Section 35 as enacted by legislature in original act in 1913 failed of approval on referendum in 1914).—(a). No public utility shall henceforth begin the construction of a new facility, plant or system, or of any extension of its facility, plant or system, without first having obtained from the commission a certificate that the present or future public convenience and necessity require or will require such construction; provided, that this section shall not be construed to require any corporation to secure such certificate for an extension within any city and county or city or town within which it shall have theretofore lawfully commenced operations, or for an extension into territory, either within or without a city and county or city or town, contiguous to its facility, or line, plant or system, and not therefore served by a public utility of like character, or for an extension within or to territory already served by it, necessary in the ordinary course of its business; and provided, further, that if any such public utility, in constructing or extending its line, plant or system, shall interfere or be about to interfere with the operation of the line, plant or system of any other public utility already constructed, the commission, on complaint of the public utility claiming to be injuriously affected, may, after hearing, make such order prohibiting such construction or extensions or prescribing such terms and conditions for the location of the lines, plants or systems affected as it may seem just and reasonable.

(b). No public utility shall henceforth exercise any right or privilege under any franchise, permit, ordinance, vote or other authority hereafter granted, or under any franchise, permit, ordinance, vote or other authority heretofore granted but not heretofore actually exercised, or the exercise of which has been suspended for more than one year, without first having obtained from the commission a certificate that public convenience and necessity require the exercise of such right or privilege; provided, that when the commission shall find, after hearing, that a public utility has heretofore begun actual construction work and is prosecuting such work, in good faith, uninterruptedly and with reasonable diligence in proportion to the magnitude of the undertaking, under any franchisie, permit, ordinance, vote or other authority heretofore granted but not heretofore actually exercised, such public utility may proceed, under such rules and regulations as the commission may prescribe, to the completion of such work, and may, after such completion, exercise such right or privilege; and provided, further, that this section shall not be construed to validate any right or privilege now invalid or hereafter becoming invalid under any law of this state.

(c). Before any certificate may issue under this section, a certified copy of its articles of incorporation or charter, if the applicant be a corporation, shall be filed in the office of the commission. Every applicant for a certificate shall file in the office of the commission such evidence as shall be required by the commission to show that such applicant has received the required consent, franchise, permit, ordinance, vote or other authority of the proper county, city and county, municipal or other public authority. The commission shall have power, after hearing, to issue said certificate, as prayed for, or to refuse to issue the same, or to issue it for the construction of a portion only of the contemplated facility, line, plant or system, or extension thereof, or for the partial exercise only of said right or privilege, and may attach to the exercise of the rights granted by said certificate such terms and conditions as in its judgment the public convenience and necessity may require. The commission shall charge a reasonable fee, not exceeding fifty cents on each one thousand dollars of capital to be invested, for issuing said public convenience and necessity certificate.

(d). Every license, permit or franchise hereafter granted to any public utility, other than a municipality, shall be subject to the provision that the municipality in which all or part of its property is situated may purchase the property of such public utility actually used and useful for the convenience of the municipality at any time as provided herein, paying therefor just compensation to be determined by the commission and according to the terms and conditions fixed by said commission. Any such municipality is authorized to purchase such property, and every such public utility is required to sell such property at the value and according to the terms and conditions determined by the commission.

(e). Any municipality shall have the power to purchase either with or without an agreement with any public utility or to acquire and to operate the property of any public utility actually used and useful for the convenience of the public then operating under a license, permit or franchise existing at the time this act takes effect, or operating in such municipality without any permit or franchise.

(f). Whenever the commission shall have been notified by either party that the officials of a municipality have, by ordinance duly passed, expressed the intention and desire of the municipality to purchase the plant, property or facilities of a public utility, and that the parties of such purchase and sale have been unable to agree on just compensation to be paid and received or the officials of a municipality have by ordinance duly passed, expressed the intention and desire of the municipality to purchase any such plant, property or facilities of a public utility and the owner thereof has refused to sell the same, the commission shall proceed to set a time and place for a public hearing upon the matters of the just compensation to be paid for the taking of the property of such public utility and of all other terms and conditions of the purchase and sale, and shall give to the municipality and the public utility interested not less than thirty days' notice of the time and place when and where such hearing will be held, and shall give like notice to all persons having any interest in such public utility, by publication. Within a reasonable time, not exceeding one year, after the time fixed for such hearing, the commission shall, by order, fix and determine the just compensation to be paid for the taking of the property of such public utility actually used and useful for the convenience of the public, and all other terms and conditions of sale and purchase which it shall ascertain to be reasonable.

(g). Any municipality which has acquired or constructed any public utility plant, property or facility shall have the power to contract with a public utility for the operation of any part or the whole thereof, subject to the provisions of this act, and to exercise by the commission in respect to such public utility of the powers of regulation and supervision conferred upon it by this act.

Maine

Joint petition by Myron P. Ayers and the New England Telephone and Telegraph Company for an order authorizing the sale

by the former to the latter of a telephone plant and property situation in the towns of Dennysville, Edmunds and Marion, for the sum of $1,200. Notice ordered and proved. Hearing at Augusta, May 9, 1917.

The Dennysville Lumber Company formerly owned and operated a telephone plant in said towns. To facilitate its operation and the adjustment of the affairs of this company, the title to the plant was transferred to Myron P. Ayers, February 13, 1917, and Mr. Ayers has now sold the same, subject to commission approval, to the New England Telephone and Telegraph Company, to be operated as part of its system. The price is based on an inventory and the unit costs which prevailed in 1913.

At the hearing it appeared that the sale by the Dennysville Lumber Company to Mr. Ayers had not been approved by the commission, the parties thereto not having been aware of the necessity of such approval. Until so approved it was void. Action, therefore, was suspended, after taking out the evidence, until the above supplementary petition might be filed, which was done June 6, 1917.

The commission finds that both said sale and said proposed sale are consistent with the public interest and that they ought to be approved, and it is ordered, adjudged and decreed:

1. That the sale by the Dennysville Lumber Company to Myron P. Ayers of its telephone plant, property and franchise in the towns of Dennysville, Edmunds and Marion, February 13, 1917, be ratified and approved;

2. That Myron P. Ayers be authorized to sell and convey said telephone plant, property and franchise to the New England Telephone and Telegraph Company, and the last named corporation to purchase and operate the same.

Minnesota

W. M. James, doing business as the New Brighton Telephone Company, has operated a local megneto telephone exchange in the village of New Brighton since 1901. The exchange has had exclusive connection with the Tri-State Telephone and Telegraph Company exchange at Minneapolis. Subscribers of the New Brighton exchange are paying a rate of ten cents per message for service to St. Paul and Minneapolis. The greatest number of subscribers served at any one time was forty-six. This number has been reduced to thirty-four at the present time for the reason that the majority of the telephone users in New Brighton and vicinity have desired direct telephone connection with the Twin Cities. Twenty of these subscribers are located within the village proper, six of which are business and fourteen residence. The remaining fourteen are rural subscribers in the vicinity of New Brighton. The entire exchange, including central office equipment and outside construction, is in very poor condition, and immediate reconstruction is necessary in order to provide good telephone service. There has been a demand on the part of the public for some time past for automatic service, but the present owner finds himself unable to finance reconstruction of the plant and furnish the public with the telephone service it desires. A number of the business houses and residents at New Brighton have for some time past applied to the Tri-State Company for Twin City service and have refused to accept service from the local exchange. The consideration agreed upon by the parties interested in this transaction is $700. The Tri-State Company proposes to immediately place the New Brighton plant in a first-class operating condition by the installation of automatic central office equipment and reconstructing the outside plant so as to furnish an adequate commercial service with its St. Paul and Minneapolis exchanges. The Tri-State Company has already secured contracts for seven business stations, eleven residence stations within the village, and sixty-seven rural stations. The rates charged will include service to St. Paul and Minneapolis.

It is therefore ordered, that the Tri-State Telephone and Telegraph Company be permitted to purchase from W. M. James, doing business as the New Brighton Telephone Company, his local telephone exchange and rural lines at New Brighton, Minnesota.

The Turtle Lake Telephone Company is a co-operative rural company operating but two rural circuits, serving twenty-one stations north of the city of St. Paul and in the vicinity of Turtle Lake. For several years last past this company has received service with the city of St. Paul by reason of a connection with the local exchange of the Northwestern Telephone Exchange Company. The connecting agreement with the Northwestern Company expired on June 11, 1917. The company has been paying for this service $1.00 per telephone per month to the Northwestern Company and the maintenance expenses of the company have brought the total cost of service to each of its members to approximately $15.00 per year. The members of the company feel that they cannot continue to operate their lines at this figure and that ultimately it will be much cheaper to buy their service outright from the Tri-State Company than to continue to operate the lines and receive exchange service upon the switching basis.

The rate for eight-party automatic rural service of the Tri-State Company in the territory served by the Turtle Lake Company is $2.50 per month. Seventeen of the Turtle Lake subscribers have already contracted with the Tri-State Company for service at this rate. The Tri-State Company will furnish necessary circuit facilities to serve all applicants for service in the territory now served by the Turtle Lake Company as well as in the territory adjacent thereto. Those subscribers of the Turtle Lake Company who prefer the service of the Northwestern Telephone Exchange Company can obtain that service upon application over rural lines of that company serving the same territory. The sale of the property of the Turtle Lake Telephone Company was ratified at a meeting of the stockholders held April 28, 1917. The price agreed upon by the parties interested is $1,800.

It is therefore ordered, that the Tri-State Telephone and Telegraph Company be permitted to purchase the telephone properties or rural lines of the Turtle Lake Telephone Company.

Application has been filed by the Hutchinson Telephone Company, in which it is alleged that business and professional men of Hutchinson have requested that the present magneto telephone service be replaced with common battery telephone service; that the company now has approximately five hundred telephones; that contracts have been received from the majority of its subscribers for the proposed service; that the company has expended approximately $6,000 for additional equipment and will have to make an additional expenditure of $3,000 necessary to complete the conversion of its magneto exchange to common battery; that in order to furnish such service and to secure a reasonable return on the investment, it is necessary to increase the local exchange rates.

A hearing on the above matter was held at Hutchinson, Minnesota, June 21.

Nebraska

What is a telephone line on a public highway? Does it consist merely of poles and wires belonging to a telephone company, or must there also be subscribers connected therewith?

At Minatare, in Scottsbluff county, Nebraska, the Citizens' Telephone Company operates some lines running into the surrounding rural territory. An electric light and power company recently constructed a high voltage transmission line from Minatare to Bayard, which at one place parallels the poles and wires of the telephone company for a distance of half a mile, within a few feet of them.

Now comes the latter corporation and says the electric concern violated the state law by building its line without getting the approval of the railway commission or the consent of the telephone company.

The electric company claims it is within the law, because the half mile of telephone wire is not in use to serve any patrons, but is simply a dead end. It contends that this is not a telepone line, and therefore the paralleling of it without a permit did not infringe the statute.

The theoretical purpose of the law restricting transmission lines is to prevent interference with telephone service by heavily charged electric wires. It has been asserted by electrical interests that the telephone companies of the state had the law passed so they could compel the electric companies to buy some of their discarded or superfluous pole lines on country highways.

Executive officials of the Monroe Telephone Company, with their attorneys and principal stockholders held a meeting to consider the recent order of the state railway commission with respect to a stock and bond

issue authorized. The acceptance of the company is necessary before any rate order will be made for the consolidated exchange at Albion.

If they carry the matter into court, as is now most likely, the judiciary will be called upon to settle a point that is entirely new in regulation. The company operates a number of exchanges in northeastern Nebraska, with about 2,000 telephones attached. It is desired to purchase the competing exchange at Albion, but owing to a delay in the matter of getting stockholders to authorize the necessary bond issue, several interested men, including Col. John P. Bratt of Lincoln, and his brother, Alfred Bratt of Genoa, stepped in and bought it for $55,000 in trust for the Monroe company.

After all the legal kinks had been ironed out the company asked the railway commission to authorize the issue of $55,000 worth of stock to take over the Albion plant, as well as other stock for other purposes. The commission declined to approve that amount for that purpose and found that the money that had gone into the plant and upon which returns could be allowed was about $25,000. Stock for that amount to take over the Albion plant was authorized. As this leaves the trustees $30,000 out of pocket, it is considered certain that they will take the matter into court on appeal.

The commission would be glad to have this done. Commissioner Taylor, who wrote the opinion, said that the commission had adopted the policy that unearned increment could not be absorbed by the owners of a public service corporation and that where surplus earnings have gone back into a plant stock will not be allowed issued therefor. He said that the commission would welcome an appeal because if in error it desired to be corrected before further action was taken. In this case the men who profited by the unearned increment were the men who sold out to the trustees for they got the full value of the property. The figures of the railway commission show the actual value of the Albion plant to be around $50,000, but it declines to allow more than $25,000 stock to be issued because the other $25,000 worth of property was paid out for earnings above what the commission finds was proper salary for the managers and proper returns on the actual investment.

Mr. Taylor says that economists generally approve of the theory of the commission, and that it is manifest that if pyramiding like this is permitted there would be no limit to the rates that would be charged for service. This is exactly what has happened in the case of the railroads. They have used surplus earnings in building more lines and buying more equipment and then ask for higher rates in order to pay the interest on the combined investment. Then the process is begun all over again.

A number of other telephone companies in the state will be interested in the ultimate decision in the matter. They have been paying as high as 45 per cent interest on their stock. The average telephone company, in its early years pays little attention to the fact that in a decade its plant will begin to go to pieces and must be rebuilt every twelve or fourteen years. To care for this they are required by law to lay aside a sufficient sum as a depreciative reserve, but very few do it. They prefer to take it themselves as dividends. Their cases are to be investigated by the commission and they are likely to fall under the same rod used in the Albion case.

The Coleridge Telephone Company has been given permission by the state railway commission to increase rates upon its exchange at Hartington, an application that has been pending for over two years. The new rates are expected to increase by $400 a year the gross revenues of the company, which has never paid any considerable returns. There are 122 telephones in use in town and 230 rural telephones are connected with the exchange. The company owns a part of the instruments, and the remainder were bought by subscribers. A lower rate has been given the latter, but the difference was found by the commission to be too large in favor of this class. The net result of the new rate will be to decrease the spread between the two rates.

After a consultation with officers of the Glenwood Telephone Company the railway commission issued an order that it charge a uniform price for service to all patrons, whether they are stockholders or not. Heretofore the stockholder has been charged less, on the theory that as the company pays no dividends that is how he gets the interest on his money. The company made no very strenuous objections to the order, as some of the stockholders have been doing a little figuring and find that counting the interest on their investment they are really paying more than the non-stockholding subscriber. The company operates twelve exchanges in Webster and Adams county through a system of district organizations.

The Lincoln Telephone Company has asked the railway commission for permission to cancel a four party business telephone rate at Raymond, Malcolm and Waverly of $3.50 a year on the ground that there are no subscribers, the business men all preferring the $4.50 two party rate. The commission has denied the request. The Lincoln company has received authority to publish an optional metallic rate at Syracuse, being an increase of 75 cents a month for business and 25 cents a month for residence rates, grounded service. The Southeastern Nebraska Telephone Company of Falls City has received leave to increase individual residence rates 25 cents a month. The rate has been $1 a month, metallic service.

Pennsylvania

The Public Service Commission, in an opinion by Commissioner Alcorn, has dismissed the complaint of Anne T. Scribner against certain divisions of territory in suburban Philadelphia into telephone districts. It was charged that the division was made by a line which operated to make "an arbitrary, discriminatory and unjust service in favor of the Oak Lane zone and against the residents of the Melrose zone," and that real estate values were affected and people required to pay rates to which the complainant excepted.

In a review of the case, Mr. Alcorn holds that "if the contention of the complainant should be sustained and that portion of the Melrose territory for the reason which she advances be connected with the Oak Lane zone, the residents in the territory adjoining the Melrose area would have as much reason to ask the commission to connect that territory with the Melrose and Oak Lane zones, so that against the judgment of the telephone company additional territory would thus be continually added to its Philadelphia exchange."

On January 26 the residents of Oak Lane and Mel-

rose complained at a hearing here before Public Service Commissioner Alcorn against the Bell Telephone Company of Pennsylvania, because of the "nickel-across-the-street" charge for calls. It was explained that City Line divides the suburbs and that it also marks the boundary of a telephone zone. Consequently when Melrose residents call up their neighbors across the streets in Oak Lane they must pay a charge of five cents, and vice versa.

After a delay of nearly three years, the Public Service Commission has approved the proposed lease of space in the Keystone Telephone Company's conduits by the Philadelphia Electric Company.

The commission did not render a formal decision, but issued a statement in Harrisburg, approving the lease, and explaining that it did not wish to make any comment on the valuation of the conduits as calculated in the application.

The statement follows:

In re-application of the Keystone Telephone Company for approval of a lease between said company and the Philadelphia Electric Company, providing for the leasing of certain space in the conduits of the telephone company, the commission approved the leasing, subject to the condition that the commission did not pass upon, or express, any opinion as to the valuation placed on the conduits by the Keystone Telephone Company in arriving at the rental to be paid for the use of the ducts by the said Philadelphia Electric Company. The price agreed upon was 4 cents per duct foot. No formal decision was handed down.

The case was one of the most protracted that has come before the commission. The first application was made three years ago. After many hearings the commission, about eight months ago, decided against the request on the ground that the proposition was not fair and equitable. The two companies then made a second application, with the result announced last night.

It was the question of rental that caused the delay. According to the statement, the commission adheres to its original opinion upon this phase of the matter, but consents to the arrangement because both companies appear to be satisfied.

The Public Service Commission in an opinion by Commissioner Ryan has dismissed the complaint of the Slate Belt Telephone and Telegraph Company that the Blue Mountain Telephone and Telegraph Company had secured control of the Warren Telephone Company, a New Jersey corporation operating in Easton without securing a State certificate.

Both the companies operate in Northampton county and it is declared in the opinion that there is no proof of direct acquisition and that no money of the respondent company was used in the purchase, but that men interested in the company bought stock in the Warren as private individuals. This condition, the claimant contends, formed "indirect control," but the opinion says the evidence does not disclose any such intention in the case.

"It would be a most hazardous proceeding for one corporation to attempt to secure control of another by procuring the purchase of its stock by an individual in his own name and without any agreement or undertaking to transfer such stock to the company. For there would be nothing whatever to keep such individual from retaining such stock for his own benefit."

The question of when a rural telephone line shall be considered to have all the subscribers it can accommodate was argued before the Public Service Commission in complaints of residents of Perry county against the Buck Valley Rural Telephone Company No. 2. The company contended it had 18 and 20 people on some lines and could not care for more.

Ohio

A protest against the valuation of the Cleveland property of the Ohio State Telephone Company as fixed by the state public utilities commission was forwarded to the commission by City Law Director Fitz-Gerald and Assistant Law Director Woods of Cleveland.

In the opinion of the city representatives, the overhead charges allowed by the commission are too high. The telephone company already has filed a protest that the valuation is too low.

The commission has placed the valuation at $3,884,778.29. The company claims that its property is valued at $5,929,737.32. There will be a hearing at Columbus, July 24.

The Ohio State Telephone Company has filed with the state utilities commission a new schedule of rates for its service in Youngstown, the new rates to become effective July 1. Service will be billed monthly in advance as follows:

Main line business—$4.75; 2-party business, $3.25; 4-party business, $2.75.

Main line residence—$2.25; 2-party residence, $2.00; 4-party residence, $1.75.

All of these rates are subject to 25 cents a month discount if paid on, or before, the 15th of the month.

Citizens of Blanchester, Martinsville, New Vienna, Sabina and Clarksville, Clinton county, filed a complaint with the public utilities commission against the proposal of the Clinton Telephone Company to increase toll rates.

Washington

Telephone affairs in Spokane again are to be investigated, the valuation of plants to be fixed and a new schedule of rates is to be prepared by the state public service commission. The city is not, as yet, a party to the new suit, but may join later.

The city won one point when it succeeded in getting the dismissal of the Home Telephone Company's attempt to become a party in the old 1911 rate suit before the commission. Petitions asking for a new suit will be on shortly.

City officials regard the outcome of the case as satisfactory. As matters now stand the Ellertson decision, holding the company to its franchise rates, probably will stand until the commission prescribes new rates, which will not be for months, and perhaps years.

Petitions engineered by the telephone company and signed by about 30 business houses, were filed with the commission asking that the commission proceed at once to value plants and exchanges of the company in the city, and on that basis prescribe future telephone rates and regulations. Among the signers were the Old National bank, Exchange National bank, Shaw-Borden Company, Finch Investment Company, Pantages theater and Hill Brothers.

A motion to dismiss the old case was promptly

made by A. M. Winston, assistant corporation counsel, who, with J. M. Geraghty, was representing the city. The commission granted the motion for dismissal after the telephone company and the city had stipulated that evidence and testimony gathered during the last few years in the telephone controversy may be used so far as it is applicable and can be agreed upon in the new case.

The Public Service Commission as an administrative and regulative body is not bound to acquire its information concerning all matters involved in a proceeding before it entirely from the evidence of witnesses or other evidence produced before it, but may take into consideration the results of its general investigations, general information upon a given subject within its powers, and all matters which affect the matter and concerning which it must determine the facts, the Supreme Court of Washington held (163 P. 1143).

West Virginia

New telephone rates affecting service in 68 towns and cities in West Virginia were approved by the public service commission, on the petitions of the Chesapeake & Potomac Telephone Company, of West Virginia, Consolidated Telephone Company, of West Virginia, the Central District Telephone Company, and the Chesapeake & Potomac Telephone Company.

The new schedule of rates, it is understood, will form the basis on which a general consolidation of service by the companies parties to the application granted today will be made. The new rates establish increases in some places and decreases in others, being an attempt at equalization.

The towns and cities affected by the commission's order include Altenheim, Beckley, Belington, Benwood, Berkeley Springs, Beverly, Blaine, Buckhannon, Burnsville, Charleston, Chester, Churchville, Clarksburg, Clendenin, East Bank, Elkins, Elm Grove, Fairmont, Fairview, Farmington, Fayetteville, Follansbee, Glenville, Grafton, Hodgesville, Hinton, Huntington, Inwood, Jane Lew, Keyser, Kenova, Laurel Point, Logan, Madison, Mannington, Martinsburg, Mason City, Matewan, Montgomery, Morgantown, Moundsville, Mount Hope, New Cumberland, New Martinsville, Oak Hill, Parkersburg, Philippi, Piedmont, Pt. Pleasant, Ravenswood, Richwood, Ripley, Rock Cave, St. Albans, Salem, Shinnston, Sistersville, Spencer, Sutton, Thurmond, Wallace, Warwood, Wellsburg, Weston, Williamson, Weirton, Wheeling and Williamstown.

Civil Service Examinations

The United States Civil Service Commission announces an open competitive examination for telephone operator, for both men and women, on July 11, 1917. Vacancies in the position of telephone switchboard operator in the Departmental Service at Washington, D. C., at salaries ranging from $660 to $720 a year, will be filled from this examination, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer, or promotion.

The United States Civil Service Commission announces an open competitive examination for telegraph and telephone inspector, for men only, July 17. From the registers of eligibles resulting from this examination certification will be made to fill vacancies as they may occur in this position in the Interstate Commerce Commission under the act providing for the valuation of the property of common carriers, and in positions requiring similar qualifications in other branches of the service, unless it is found to be in the interest of the service to fill any vacancy by reinstatement, transfer, or promotion.

As a result of this examination three registers of eligibles will be established, the salaries in each case ranging from $1,200 to $1,800 per annum with necessary expenses when absent from headquarters in the discharge of official duties.

The three registers to be established are as follows:

(1) Eligibles who have had telegraph experience with telegraph companies or with railroad companies, or who have had a combination of telephone and telegraph experience with railroad companies. In the latter case applicants should fully state the amount of each kind of experience, as the combined experience will qualify for this register even though the experience be largely telephone.

(2) Eligibles who have had general experience with telephone companies only.

(3) Eligibles who have had combined general experience with telegraph companies or railroad companies as outlined in (1) and telephone companies. To qualify for this class the applicant must have had at least three years' experience in each branch (telegraph and telephone) of the work.

Appointments to these positions will be principally for field service.

The United States Civil Service Commission announces an open competitive examination for junior signal engineer, for men only, on July 25, 1917. Vacancies in the Interstate Commerce Commission under the act providing for the valuation of the property of common carriers will be filled from this examination, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer, or promotion.

The following positions established under the above act will be filled from the register resulting from this examination:

Junior signal engineer, Grade I, $1,200 to $1,680 a year.

Junior signal engineer, Grade II, $720 to $1,080 a year.

In addition to the above salaries necessary expenses will be allowed when absent from headquarters in the discharge of official duties.

The United States Civil Service Commission announces an open competitive examination for junior telegraph and telephone engineer, for men only, on July 25, 1917. Vacancies in the Interstate Commerce Commission under the act providing for the valuation of the property of common carriers will be filled from this examination, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer, or promotion.

The following positions established under the above act will be filled from the register resulting from this examination:

The salaries and allowance are the same as for Signal Engineer.

Of Interest to the Trade

What the Telephone and Accessory Manufacturers Are Doing to Advance the Art

Uses for Stromberg Mine Telephone

A short time ago a refrigerating room in a Texas packing house was closed for the night and one of the employes was locked in, with the result that he was frozen to death before the doors were opened next morning.

An enterprising Stromberg-Carlson salesman read of the accident the following day and forthwith interviewed the packing house company upon the advisability of installing telephones in the refrigerating rooms to prevent any serious mishaps in the future. As a result of the conference the owners of the plant authorized the installation of the Stromberg-Carlson Company's No. 890 mine telephone in all of the rooms because of its moisture-proof qualities, which are quite essential for service of this nature.

Another interesting installation of these instruments has been made in Philadelphia in a manufacturing plant where the fumes of benzol and other inflammable vapors are apt to be present. The No. 890 telephone is particularly well adapted for service under such conditions because all of the contact points where sparking might occur are well enclosed within the sealed apparatus compartment of the set.

Managers of telephone companies should not overlook the possibilities of installations in places where a telephone acts as a "Safety First" appliance of the first order.

Kellogg at Louisville

Could you have seen Bryant, Vivian, Hosea, Harvey Allen and Corman sailing around in the Fountain Park airships, or seen Prueitt, Duncan, Terry Allen and Parlett in the giant coaster at the same place, you would have known that the annual convention of the Southern States Independent Telephone Association at Louisville, week of May 24, 25 and 26, was highly successful.

Kellogg's Exhibit at Louisville.

These staid and dignified gentlemen could not have shouted themselves hoarse in these worry-killing devices at an amusement park if they had not been working together, heart and soul; and what convention could possibly fail when those attending are working together?

These high jinks at the amusement park were part of a half-day's relaxation from the routine of convention meetings; the frolic beginning with an enjoyable automobile ride through Louisville's famous drives and parks, ending with a grand supper, Southern style, at Fontaine Park, free rides on the coasters, dancing, and to cap the climax, an exceptionally fine vaudeville.

These sessions were held in the Louisville Hotel, whose large, high ceilings and old-fashioned rooms lent a spirit of welcome foreign to many more sumptuous hostelries.

All of the meetings were successful, and the subjects discussed were of very real and timely interest to all concerned.

We must not forget to mention that the Kellogg Company brought down its complete exhibit, the same as is shown at the largest of these meetings, and its efforts and the comprehensive display of telephone equipment which it had were appreciated.

The Kellogg room, if anything was a little too small to show off so much apparatus to best advantage, but the solid-appearing apparatus panels of magneto, common battery and grabaphone telephones and cords, and the illuminated display boxes of complete telephone apparatus were examined with interest by practically every one of the 140 telephone men present.

The Preservative Process

How America Is Beating the Germans by Capturing Their Business in This Field

One of the most interesting developments of the World War has been the growth of many American industries which it has caused. Previous to the war, Germany found America a rich market and her products were more extensively sold in this country than many poeple realized.

Since 1914, however, and the cessation of all German importation, America has begun to manufacture for herself many products which she used to obtain abroad. Our manufacturers are capturing the German trade in this country with American-made goods. American skill and resourcefulness are now producing many products which it was thought impossible to manufacture here until necessity found the way.

An example of especial interest to engineers is found in the line of the so-called carbolineum—or anthracene—wood-preserving oils. Before the war, not only the openly trade-marked German oil was sold here, but there were many American organizations acting as German agents.

Today there is scarcely a drop of the German oil sold in the United States, and the American product is completely and permanently dominating the market.

Of the circumstances attending this remarkable accomplishment and the method of its performance, E. E. Pershall, general superintendent of the Kettle River Company, says:

HOW THE GERMANS OBTAINED THEIR FOOTHOLD.

"One of the reasons why the German oil was so established in America was its so-called secret process of manufacture, which was impressed upon each buyer at the time of sale. The oil was said to contain mysterious chemicals and to be made by secret processes known only to the Germans. In fact, the promoters of the foreign oil even went so far as to attempt to educate American engineers to believe that the proper coal for the production of carbolineum oils could not be found in America.

"The German manufacturers had the American public so completely buncoed on this question that they practically controlled the market. Americans engaged in the wood preserving business found it more profitable to act as local representatives for German agents than to attempt to compete.

EXPOSING THE GERMAN CLAIMS.

"The falsity of the German claims was well known to our chemists. We knew them to be nothing more than a clever sales scheme. The United States Government tests had proven the perfect wood preserver to be the high boiling creosote oil distilling above 300 degrees C., providing that the oil was a pure coal tar distillate. There was nothing mysterious or unusual about either the formula or the coal. Every one in the creosote business knew that America had many times the amount of the proper coal that Germany ever had.

"The beginning of the war in 1914 gave us a chance to expose the German fallacy and find a market for the American oil. Immediately with the outbreak of hostilities abroad, all shipment of German carbolineum wood preserving oil to this country stopped.

"This was our opportunity. As the largest manufacturers of creosote products in the United States we were in a position to begin production immediately.

"We at once erected stills and the other machinery used in the production of the German Carbolineum grade of wood-preserving oil. When analyzed according to the method described by the United States Signal Service and the United States Navy, the wood preserver which we produced passed a specification which showed our oil to be the highest grade produced either in Germany or America.

THE AMERICAN OIL.

"As soon as the American engineers found that right here at home we were producing a higher grade wood preserver than the German, we had no trouble finding a market.

"If we had not been able to manufacture this oil, the American trade would have found itself facing a wood-preserver famine. As in the case of so many other home products, the war made it necessary for America to supply herself, and thus gave the American manufacturers the opportunity to capture the trade.

"Now we feel the time has come for the American manufacturers to stand on their own feet and establish the American brand. We have organized our own sales department and are now marketing our oil under our trade-marked name of 'K-R-Wood Preserver,' in all grades for open tank treatment.

"The German oils will never again be able to compete seriously in the American market. We have shown the engineering world the superiority of the American oil and have established trade relations which will always make the American oil the choice of American engineers."

Another S.-C. Bulletin

STROMBERG-CARLSON TELEPHONE MFG. CO
ROCHESTER, N.Y. CHICAGO, ILL.
KANSAS CITY, MO. TORONTO, ONT.
BULLETIN NO. 1019 EDITION 7-D
Exchange Ringing Equipment
Pole Changers · Generators · Motor Generator Sets
Harmonic Converters

This is the Stromberg-Carlson Telephone Manufacturing Company's Bulletin No. 1019. It is in the familiar loose-leaf form, carrying fourteen pages inside its cover. It goes without saying that every telephone exchange should have a copy in its files—after every word has been carefully read. The S-C company will send one.

S.-C. Employes Buy Bonds

Stromberg-Carlson employes showed by their response to the nation's call for Liberty Bond subscriptions that their patriotism is not confined to flag waving and song singing, but that it is backed substantially by their dollars. At the close of the subscription on June 14, $33,850 in Liberty Bonds of various denominations had been signed for by 532 individuals.

The subscription contest between two picked teams of amateur bond salesmen resulted in favor of the "Bankers," captained by George A. Scoville, who registered 232 points. The "Brokers" team, captained by E. W. Anderson, gave them "a run for the money" by scoring 228 points. The latter team, however, sold a larger amount of bonds, $15,750 in all, against $13,500 sold by the winning team. The honors, therefore, are pretty evenly divided. The difference between the total amount of bonds sold and those sold by the teams represents unsolicited subscriptions turned in after the contest closed.

Some of the stories told by the solicitors are worth repeating. One is told by one of the men who interviewed a machinist who, from all appearances, was not rolling in wealth. The solicitor thought, therefore, that the "savings" side of the subject was the one to play up strong. After listening to the benefits of having ready money, for about 10 minutes, Mr. Machinist dug down

into his jeans and pulled out a roll of bills, peeled off five yellow-backed twenties and said, "Yes, I guess what you've said is about right—I'll take a $100 bond." Another man who did not get in on the bond subscription before the close of the contest went up to his foreman on the day before the loan closed and said, "All the boys are kiddin' the life out of me—can't you get a bond for me?" He got his bond and our greater respect because he owned up and came across with his "bit."

The little folks were not forgotten when the cards were signed, for many of them were made out for Johnnie and Mary by proud fathers who thereby laid a good foundation for the future happiness of their loved ones.

New Kellogg Apparatus Catalog

The Kellogg Switchboard & Supply Company, Chicago, has recently published a complete catalog on telephone apparatus. This catalog is printed on high-grade paper, and practically every article mentioned is illustrated to the best advantage from the customer's viewpoint. The copy is clearly written in non-technical language, making it easily understood.

About 35 pages are given to piece-part plates, which show the different pieces of Kellogg apparatus disassembled, with the piece-part number of each part. This enables the customer to order a washer or certain spring for his key or a part for his transmitter without any trouble or confusion whatsoever.

The No. 3 Catalog.

In addition to showing the new Kellogg low keyshelf switchboards the catalog also shows dimensional and face equipment drawings—an advantage when ordering switchboards. The apparatus is so indexed that any of the contents can be found instantly.

The Kellogg Company will be glad to furnish any telephone company with a copy. Just drop a card asking for a copy of the Catalog No. 3.

Attica Company Buys S.-C. Equipment

One of the chief improvements to be made to the Attica Telephone Company's plant at Attica, Indiana, will be the installation of a new 900 line central energy lamp signal multiple switchboard for which a contract has been made with the Stromberg-Carlson Telephone Manufacturing Company of Rochester, N. Y.

The central office apparatus now in service will be replaced by new equipment including in addition to the main switchboard, a two-position toll switchboard, main distributing frame, relay rack, cable racks and power plant. Included in the last named item are a set of storage batteries, a four-frequency harmonic converter and a relay interrupter set.

In accordance with the telephone company's progressive policies the new main switchboard will include many of the Stromberg-Carlson Company's automatic feature circuits and apparatus such as automatic periodic ringing with instantaneous disconnect, automatic listening, flashing recall signal on the answering cords. The use of these devices together with the arrangement of the line lamps associated with the multiple jacks will increase the speed and accuracy of the service rendered.

The increase in the amount of long-distance business originating in and clearing through Attica will be cared for adequately by the new toll switchboard which is to be a model of its kind. The toll board will be fitted for the immediate operation of 20 long-distance lines with an ultimate capacity for 10 more. It will be fitted with both universal and toll-to-toll cord circuits designed to give maximum transmission efficiency under all operating conditions.

"Bessie's Burglar"

The idea of encouraging a local operating company to carry advertising on the "screens" of the motion picture theaters in its town seems to have originated with the Stromberg-Carlson Telephone Manufacturing Company of Rochester, N. Y. At least that concern has done everything to aid the telephone manager in conducting such a campaign. The particular form taken by the Stromberg-Carlson appeal consists of a drama arranged on a series of lantern slides and calculated to presuade the telephone subscriber to put in an immediate order for extension telephone service in his home. The title of the story told by the slides is "Bessie's Burglar."

The basic idea of this drama is to appeal to the inborn sense of fear that nearly all women have for burglars and to have no peace in the family until Mr. Subscriber puts his name on the dotted line of the extension telephone contract.

There's "action" in these slides and they drive home the argument in a startling manner. The slides are beautifully hand colored. The halftones shown here do not begin to do them justice. The local telephone company's name will be lettered on each slide prominently. In a moving picture house every pair of eyes is focused on the screen—every brain back of them is in a receptive condition. There's no waste circulation, no waste basket.

"Bessie's Burglar" is a big success. Wherever shown it brings a thrill, and carries a message—a message that isn't quickly forgotten. Action abounds throughout the entire drama.

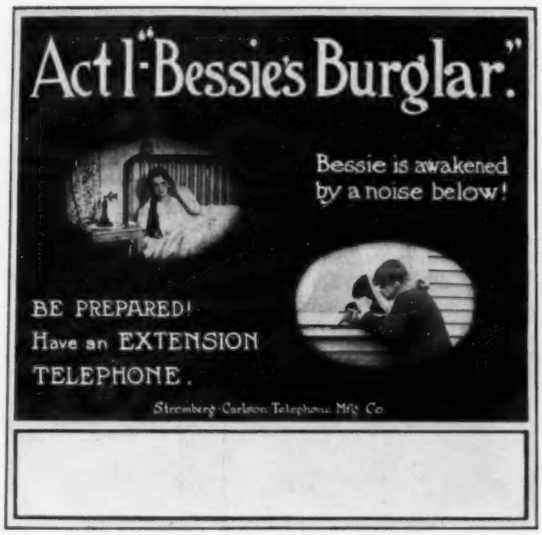
The emergency value, as well as the every-day convenience of an extension telephone, is emphasized as is possible in no other form of publicity.

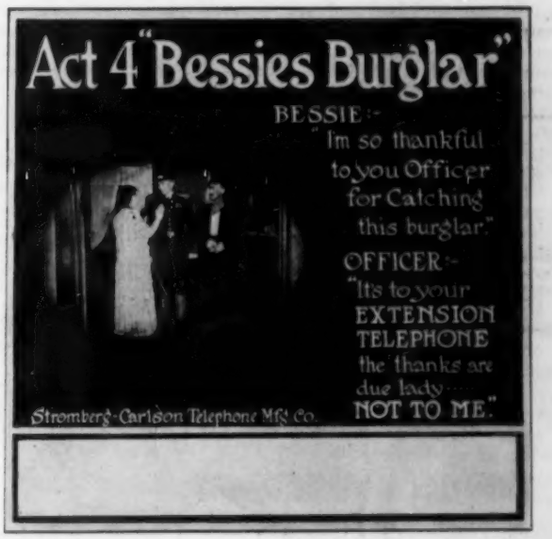
"Bessie's Burglar" most certainly draws a moral—use an extension telephone.

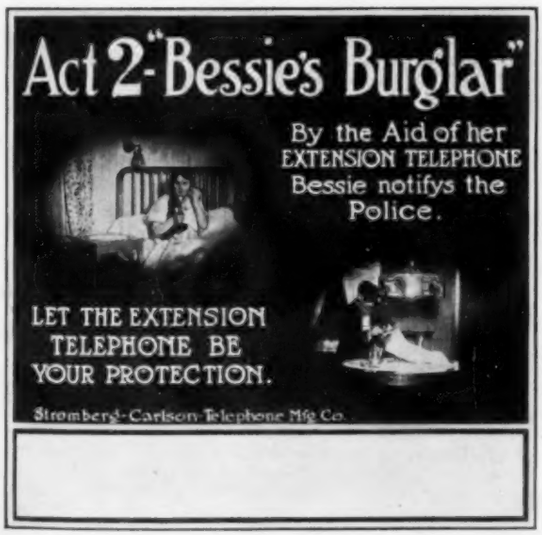
When you stop to consider that five million people attend the "movies" daily in towns of 25,000 and under, you begin to realize the enormous buying public that reads slide messages.

The company's directions for handling the slides are as follows:

Act 3-Bessie's Burglar"
The Police hurry to the home.
FOR SAFETY'S SAKE AND CONVENIENCE HAVE AN EXTENSION TELEPHONE.
Stromberg-Carlson Telephone Mfg Co.


Act 1-"Bessie's Burglar."
Bessie is awakened by a noise below!
BE PREPARED!
Have an EXTENSION TELEPHONE.
Stromberg-Carlson Telephone Mfg Co.


Act 4 "Bessies Burglar"
BESSIE:-
"Im so thankful to you Officer for Catching this burglar."
OFFICER:-
"It's to your EXTENSION TELEPHONE the thanks are due lady NOT TO ME."
Stromberg-Carlson Telephone Mfg Co.


Act 2-"Bessie's Burglar"
By the Aid of her EXTENSION TELEPHONE Bessie notifys the Police.
LET THE EXTENSION TELEPHONE BE YOUR PROTECTION.
Stromberg-Carlson Telephone Mfg Co.

Slides from "Bessie's Burglar."

Run Act I. at each performance for a week. Then put on Act II. for another week. This allows you to stretch the drama over a period of four weeks. It keeps your name and your proposition before the public constantly for an entire month.

Another plan is to run the entire drama each performance. This is possible by special arrangement with the manager of the theater. It is a more intensive way of showing "Bessie's Burglar" in action. The following week repeat the drama, and continue it for as many weeks as you see fit. Either plan works out successfully, as proven by hundreds of exhibitors throughout the country.

In order to produce this drama it was first necessary to have a scenario planned, then secure the services of competent actors and actresses, have the scenes staged and photographed; therefore the cost of producing has been great.

The company, however, has arranged to supply telephone companies with the entire set of slides, with directions for the campaign, for a merely nominal consideration. Information about it can be obtained from the advertising department.

Brevities of the Business

The Activities of the Whole Telephone Field Told in Short Paragraphs

PERSONAL NOTES

Well-known Louisville, Kentucky, men are given substantial promotion in the service of the Cumberland Telephone & Telegraph Company in connection with shifts announced by D. F. Turnbull, general manager of the Kentucky division of the telephone system. Those affected by the changes are Louis K. Webb, George G. Hall and Keith Conway. Mr. Hall, who has been commercial superintendent of the Kentucky division, has been made general manager of the Southern Telephone Company of Indiana, with headquarters at Evansville. Mr. Webb, who has been district manager, takes Mr. Hall's place at once as commercial superintendent and is succeeded as district manager by Mr. Conway, who has been special agent to the general manager.

L. P. Wells, commercial manager for the Southwestern Telegraph and Telephone Company for the Eagle Lake district in Texas, is at Orange to take charge of the exchange as manager, taking the place of George Mattox, resigned. The permanent manager is expected to arrive within the next few days.

D. M. Neill, for seven years commercial superintendent of the Tri-State Telephone & Telegraph Company, tendered his resignation in May and relinquished his connection with the company June 1. He is succeeded by Rollo R. Stevens, formerly general commercial superintendent of the Ohio State Telephone Company, Columbus, Ohio. Mr. Neill, whose home is at Red Wing, Minnesota, found that his other business interests demanded so much of his time and attention that he could not, consistently, continue his work with the Tri-State company. During his tenure in office Mr. Neill made a personal friend of every officer and employee with whom he came in contact and his departure was keenly regretted by all of his associates. As a parting recognition of their affection and regard for him, the officers of the company and all members of the commercial department tendered him a luncheon at the general office Thursday noon, May 31. G. W. Robinson, president of the Tri-State company, presided. At this time Mr. Neill was presented with a beautiful loving cup, Roy F. Wilder making the presentation speech. In the future Mr. Neill will devote his abilities and energies to personal business interests, among others the Red Wing Telephone Company, of which he is president.

W. H. Thompson, former Dayton, Ohio, man, has been appointed manager of the Middletown Telephone Company. He was formerly connected with the Central Union Telephone Company as district chief.

Ray V. Easley has resigned as manager of the Oil Belt Telephone Exchange at Bloomdale, Ohio.

Cullen A. Cain, a publicity agent on the staff of the general publicity agent of the Southwestern Bell Telephone System, who came to St. Louis and the Southwestern Company from Topeka, Kansas, where he was managing editor of the Topeka *Journal*, is leaving St. Louis to assume the managing editorship of the Bisbee (Ariz.) *Review*. Cain has been editor of the *Southwestern Telephone News* during his stay in St. Louis. A farewell dinner was given to him by President H. J. Pettengill of the Southwestern Bell Telephone System at the St. Louis Club. Among those who attended were: E. D. Nims, Ben S. Read, D. A. Frank, J. K. Wass, F. O. Hale, J. J. Robinson, W. G. Barry, A. J. Monroe, S. Cecil, E. H. Painter, R. A. Nickerson, Earl R. Britt, E. F. Carter, H. D. McBride, J. P. Crowley, A. Whorton, E. W. Meyer, W. O. Pennell, R. J. Benzel, O. J. Ryan, C. S. Gleed, A. E. Mix and Humphrey Sullivan.

James Hudson of St. Louis, a son of J. A. Hudson, president of the Columbia Telephone Company, has been awarded a commission as first lieutenant in the Signal Corps of the United States Army. Mr. Hudson is a graduate of the University of Missouri and of the Harvard Law School.

Charles E. Martin of Hayward, California, assistant supervisor of telephone lines of the United States Coast Guard, with charge of all telephone lines and submarine cables on the Pacific Coast, has been promoted to supervisor of telephone lines. Clifford F. Wurfel of Portland, has been appointed assistant supervisor.

J. A. Bell, who recently resigned as manager of the Middleton, Ohio, branch of the Bell Telephone Company, left for Dayton, where he has accepted a lucrative position. Mr. Bell made many friends during his stay in Middletown who wish him success in his new position.

F. C. Baker, manager of the Pioneer Telephone Company in Okmulgee, Oklahoma, for the past five years, has resigned, and Edward Bruton of Miami has been appointed manager.

J. J. Carty, chief engineer of the American Telephone and Telegraph Company, has received his commission from President Wilson as senior major, and twenty-five signal corps reserve companies are to be formed from the Bell operating companies, each company to be made up of one captain, two first lieutenants and an average of about 100 non-commissioned officers and men, with one major and an extra lieutenant (his adjutant) for each two companies, a total of about 100 officers and 2,500 non-commissioned officers and men.

John W. Brady, president of the Southern Telephone Company of Indiana, announced that at a meeting of the directors of the telephone company, J. R. A. Hobson tendered his resignation as general manager and member of the board of directors. E. D. Wemyss, the commercial superintendent, was elected acting manager, pending the appointment of a permanent general manager, which will probably be made before the first of July. Wemyss was also elected a director of the company to fill the vacancy created by Mr. Hobson's resignation.

Frank Binkley, of Hamilton, Ohio, who has had 13 years' experience in telephone work, has been engaged as manager of the United Telephone Company at Bellefontaine and will assume his position July 15. For seven years Mr. Binkley served as manager of the Home Telephone Company at Hamilton. He is a business man well qualified for the position he has accepted.

Ross Larrabee, a director in the Kansas City Home Telephone Company, a director in the Independent Long Distance Telephone Company, and a director in the Theodore Gary Investment Company, died at Macon, Missouri, on June 17, of hardening of the arteries. He was 47 years old and is survived by his wife, who is a sister of Theodore Gary.

W. H. Loper of northeast of Villisca, Iowa, was elected president of the Villisca Farmers' Mutual Telephone Company at a meeting held at the city hall. Mr. Loper succeeds L. F. Query in the office. John Mullen and Monroe McCoy were each re-elected to the offices of secretary and treasurer of the organization. Other business matters were also discussed at the meeting Wednesday afternoon.

Charles E. Cox, manager of the Eaton (Ohio) Telephone Company, was stricken with paralysis at his rural home, northwest of Eaton. He was unconscious several hours. His left side and speech are affected. While his condition is regarded as serious, it is the belief of the attending physician that he will survive the attack.

INCORPORATIONS

Articles of incorporation of the Delta Telephone & Telegraph Company, of Sacramento, Cal., organized to construct and operate a telephone and telegraph system in Sacramento county, have been filed. The capital stock is $350,000 and the incorporators are H. W. Glensor, Scott Hendricks, E. V. Kenney, A. D. Downing, H. J. Edwards, of San Francisco; A. J. Miller, of Berkeley, and W. E. Hills.

The Interstate Telephone Company, of West Point, Ga., has been incorporated with a capital stock of $10,000. The incorporators are T. C. Lanier and others.

Articles of incorporation have been filed by the Royal Center Telephone Company, at Royal Center, Ind., with a capital stock of $20,000. The directors are W. B. Ford, Bertha Ford and G. S. Akers.

The Akers Telephone Co., at Wingate, Ind., has been incorporated with a capital stock of $20,000. The incorporators are G. S. Akers, Mary Akers and H. T. Ristine.

The Potter Telephone Company, at Atchison, Kansas, has been incorporated with a capital stock of $7,500.

The Mt. Lookout Telephone Company of West Virginia has been incorporated with a capital stock of $5,000. The incorporators are C. A. McClung, L. O. McClung, L. E. Moses, W. H. Legg and O. H. Evans.

J. J. Doerr, C. A. Wees, H. H. Daniels of Beverly, West Virginia; J. H. Schoonover and A. E. Lytle of Elin, have incorporated the Beverly Telephone Company with a capital stock of $5,000.

The Garcia Telephone Company, at San Diego, Texas, has

been incorporated with a capital stock of $5,000. S. Garcia, Sr., S. E. Garcia and C. G. Palacios are the incorporators.

Articles of incorporation have been filed by the Laton Telephone Company of California. The capital of the company is given as $10,000, divided into 200 shares at $50 each. The directors are I. Tielman, Fresno, T. D. Marshall and A. G. Smith of Laton. The directors have already subscribed $600 between them. The company proposes to operate a telephone system in the Island reclamation district.

Yale Telephone Company, Yale, Oklahoma, capital, $10,000. Incorporators, L. W. Scherer, E. L. Scherer, Yale; W. J. Scherer, Newton, Kansas.

Tomball Telephone Company, Tomball, Harrison county, Texas, capital stock, $5,000. Incorporators: A. C. Christen, William Holderrieth, C. F. Hoffmann, E. C. Kohrmann, R. M. Huffington, William Hirsch and G. W. Brantigam.

The Aldrich and Verndale Telephone line of Minnesota was bought by George W. Castle and sold to the Partridge River Rural Telephone Company, just incorporated for the purpose of taking the line over with a capital stock of $600. George K. Castle is president of the new corporation, Archie Wilkins is vice president, D. E. French, secretary, and R. L. Benedict, treasurer.

Articles of incorporation have been filed by the Vigo Mutual Telephone Company of Indiana with County Recorder John T. Grace. The object of the corporation is to conduct a general telephone business in Vermilion and Vigo counties. The main office will be in Libertyville, Indiana. The directors for the first year are A. E. Hern of Libertyville, Ind.; Carl C. Pinson, Libertyville, Ind.; L. B. Shank, West Terre Haute, Ind.; Joseph S. Strole, New Goshen, Ind.; and Edward L. Swander, New Goshen, Ind.

The St. Joe Telephone Company, St. Joe, Indiana; capital, $10,000; to maintain and operate telephone lines and exchanges; directors, E. A. Geaque, J. A. Daniels, S. W. Tustison, S. S. Widney, Leon Sechler.

The Fort Bend Telephone Company at Rosenberg has been incorporated with a capital stock of $30,000. C. H. Waddell, J. H. Waddell and G. F. Waddell are the incorporators.

NEWS FROM THE FIELD

CALIFORNIA

The Pacific Telephone and Telegraph Company is installing improvements in the telephone service for Albany and North Berkeley to cost more than $26,000, made necessary to meet the growing demands of the district. The improvement will consist of a great length of underground conduit, poles and aerial cables all in the district north of the central office. This district is the most rapidly developing section of Berkeley, more than seventy per cent of the home building operations of the last year being done here. The district includes Thousand Oaks.

Further extensions of its service in Richmond are planned by the telephone company. Manager George Calverts' report states that the increase in the company's business here has been 500 per cent in the last seven years, occasioned by the city's fast growth.

Improvements to care for the present increase and future growth of the Pacific Telephone and Telegraph Company in Fresno are now under way and an appropriation of nearly $50,000 has been made by the main office, according to announcement made by W. F. Lehigh, the local manager. Seven distinct improvements are being made in the system and the biggest part of the work will be completed within two months, while it will require at least 240 days on the work on the Fresno line.

Construction crews on a brand new telephone line to connect imperial valley with San Diego commenced under orders to complete the work in five weeks. It is understood that military necessity is the prime reason for the rush orders being issued. According to Manager Bezdecheck, of the Imperial valley telephone system, the work will be done in first class style, a new line being hung the entire distance along the state highway and not along the railroad.

DISTRICT OF COLUMBIA

Since the war began, telephone and telegraph companies have extended their lines so that the government commands about 20,000,000 miles of exchange and toll lines, connecting more than 10,000,000 telephone stations, according to a statement today by the Committee of Communications of the Council of National Defense.

GEORGIA

A contract has been let by the government for a private telephone line from Savannah to Charleston. It is likely that this step was taken on the part of the government because this city and Charleston have been designated as ports of army preparation.

ILLINOIS

Announcement is made at Galesburg Union Telephone Company has purchased the Bell exchange and that the new Bell telephone building will be closed.

The Lanark Mutual and the Lanark Independent Telephone Companies have been merged, the business of the merged companies to be carried on under the name of the Lanark Mutual.

At a meeting of the board of directors of the Michigan State Telephone Company, held June 15, the regular quarterly dividend of $1.50 per share was declared on the preferred stock, to be paid June 30, 1917, to the stockholders of record at the close of business on June 25 1917.

INDIANA

The stockholders of the Eureka Telephone Company held their regular annual election at the court house and elected officers and directors to serve during the coming year as follows: President, Jacob A. Stevens; vice president, John L. Windell; treasurer, W. H. Keller, Sr.; secretary, Chas. P. Swarnes. Directors: 1st district, L. D. Robson; 2nd district, Jacob Schneider; 3rd district, Sam Breeden; 4th district, Marion Faith; 5th district, C. W. Reising.

IOWA

The board of directors of the Inter-State Telephone Company held a regular meeting at the office of the company at Dyersville. The regular routine of work was taken up. The members of the board are Geo. Kriebs, Elkport, Iowa; Geo. Flemming, Edgewood; James Rogers, C. M. Laxson, J. M. Dunn, Earlville.

Work of excavating for the foundation of the new home of the Ames office of the Iowa Telephone Company is now in progress and the work is being pushed forward as rapidly as possible. The work is being done by the W. F. Kucharo Construction Company of Des Mines, which was awarded the construction of the new building, which will cost between $35,000 and $40,000. The building is being erected on a Fifth street site near Clark street.

The Northwood Telephone Company which, until its sale less than a year ago, was owned by local capital for years, has again changed hands, this time becoming a part of the Western Electric Company of Mason City. A. L. Dodd, of Charles City, purchased the stock of the concern last fall and with C. C. Summers as superintendent and H. E. Moore as local manager, the company has given excellent satisfaction and rendered good service to the patrons.

The Farmers' & Merchants' Telephone Company, which owned thirty-five telephone plants in northwest Iowa, including the Webster City plant, has sold its holding to the Iowa Telephone Company. The consideration is not known, but it is the largest sale of public utilities ever made in this part of Iowa, for the Webster City plant alone is valued at about $200,000. There will be no change in the business policy of the plants under the new ownership. The headquarters of the Farmers' & Merchants' Telephone Company has been at Storm Lake.

Contract for the erection of an exchange building at Ames by the Iowa Telephone Company has been let to a Des Moines company.

Twelve hundred pairs of cable wires will be pulled into the main office of the Iowa Telephone Company at Davenport, according to District Manager E. T. Parmele, giving Davenport the largest cable in the state. The huge cable will contain 2,400 wires and is expected to relieve the extreme congestion in the down-town district of the city. It will be run underground from Third street to the office of the company at Sixth and Main streets.

The Huxley Telephone Company will extend lines during the summer to a point due south of Cambridge. The company now has a line to within one-half a mile of Cambridge, a short line to the south and the idea is to connect up the two points. It will make an excellent service for the patrons of the company and under their system of assessments the cost is but very little.

KENTUCKY

Work has been started on the rebuilding of the commercial office of the Cumberland Telephone & Telegraph Company, on South Fourth street, Paducah. The reconstruction includes an entire new business office on the first floor, new rest and retiring rooms on the second floor, and the painting of the building. The repairs will approximate $2,000. The company has established temporary business offices just across the street during the construction work, which will be completed in 20 days.

The Hazard Telephone Company, of Hazard, is increasing its capital to $25,000 and plans improvements during the summer and fall months.

MICHIGAN

As a part of the $150,000 appropriation that has been made for Battle Creek by the Citizens Telephone Company, $10,000

worth of equipment is now being placed here. The new equipment includes not only the two-wire phones that are proving so popular both for business and residence use, but also office and switchboard equipment. The work of installation is in charge of C. E. Tarte and Superintendent of Construction Stacey. Every street in Post Addition and Washington Heights are now being covered by the new cable. Two construction crews are at work in the city and it is expected that the new equipment will be in working order within a few weeks.

MINNESOTA

C. C. Nelson, general manager of the Nicollet County Telephone Company at St. Peter has started a crew of men at work repairing and improving the company's line near Norseland. The crew will work toward St. Peter, it being intended to string new wire for a distance of about five miles. The improvement is one that has been greatly needed, and will enable the company to give its patrons better service.

The Bay Lake Telephone Company has bought a section of the Aitkin-Deerwood telephone line. The line will be rebuilt and many new telephones installed. The board of county commissioners and County Engineer Motl examined State Highway No. 6, which is a part of the Black Diamond Trail. It is expected that the road will be surfaced between Deerwood and the Aitkin county lines.

NEBRASKA

The annual meeting of the stockholders of the Cuming County Independent Telephone Company was held on June 6. Following officers were elected: O. R. Thompson, president; J. E. Albers, vice president: J. W. Richmond, secretary and manager; H. E. Leisy, treasurer; Paul Wupper, G. H. Albers and O. R. Thompson, directors.

New central service on the Holstein branch of the Independent Telephone Company is a change the county has experienced lately. The efficient metalic circuit system has been installed and the switch-board transferred to the residence of Mr. Lewallen.

NEW YORK

The laying of the largest submarine telephone cable in the world, that under Raritan Bay between Eltingville, S. I., and Keansburg, N. J., was completed, according to an announcement by the New York Telephone Company. The work of laying the cable was begun on June 8, with officers of the New York Telephone Company, the American Telephone and Telegraph Company, and the Western Electric Company as witnesses. The new cable is nearly five and one-half miles in length, and is the longest maximum size duplex submarine cable in existence. There are underwater telephone cables on the Pacific coast and across the English Channel which are longer than the Raritan Bay cable, but they contain only from two to sixteen pairs of wires, as compared with the seventy-four pairs of wires for transmitting telephone calls and the twelve pairs of wires for testing purposes which are in the Raritan Bay cable. Recently the New York Telephone Company laid a submarine cable of the same capacity, but not so long, across the Hudson River between Tarrytown and Nyack. Besides completing a new all-cable toll line fifty miles long between New York City and Spring Lake, N. J., the new submarine cable increases the number of circuits available for handling telephone traffic from New York and Newark to telephone central offices in Monmouth and Ocean counties, N. J., and materially improves the transmission qualities of these circuits. Some of the larger communities served by this toll line are Asbury Park, Long Branch, Red Bank and Sea Bright.

An order made by Vice-Chancellor Lane permits the New York Telephone Company to become the owner of all the physical assets of the Newark Telephone Company, which has been in business in Newark in a small way for years. George W. C. McCarter, receiver for the Newark company, is allowed to accept a bid of $75,000. This does not include the company's franchise, which does not expire until 1945, nor is the sale in any way to be subject to the franchise.

The New York Telephone Company is to erect a new exchange building at No. 935 Hertel avenue, Buffalo. This will cost $115,600. New buildings are to be erected by the Contact Process Co. on the bank of the Buffalo river, which will cost about $30,000.

NORTH CAROLINA

Plans and specifications for the office and exchange to be erected at the corner of Broad and Hancock streets, New Bern, by the Home Telephone and Telegraph Company have been drawn and placed in the hands of the contractors. The building will be two stories in height and will have a basement. It will be constructed of some durable material and will be modern in every particular.

NORTH DAKOTA

The North Dakota Independent Telephone Company through F. L. Shuman is negotiating for the purchase of the exchange at Parshall. Special toll lines are promised between this city and Stanley.

Contracts have been let by the Moore & Liberty Telephone Company for the erection of an $8,000 office building to be constructed at Enderlin immediately to house the central. The building will be 30x40 two stories high and modern throughout. It will be built on the site of the present exchange. An Elbow Lake man got the contract for building and O. H. Nundenfeldt the plumbing. On the first floor will be the office and in the rear rooms for the central girls. On the second floor the manager will have his home.

OHIO

The Cincinnati Realty Company, owner of the Hotel Sinton, paid $57,500 for the former home of the Cincinnati and Suburban Bell Telephone Company, on Vine street, according to a deed placed on record. The sale was made some months ago.

SOUTH DAKOTA

The Alcester exchange of the Farmers' & Merchants' Telephone Company has been sold to the Northwestern Telephone Exchange Company, which already has assumed control.

TEXAS

The Southwestern Telegraph and Telephone Company has prepared plans and shortly will begin construction of a new exchange in San Antonio. The new institution will represent an investment of something over $40,000 when equipped, and will be located on ground recently acquired by the company at South Presa street and Grove avenue in South Park Terrace. It will be a two-story structure and will be equipped with the most modern devices and machinery for telephonic communications including apparatus which is to be found in only a few of the largest exchanges installed within the last fourteen months. The switchboard will accommodate 10,000 telephones at capacity. The telephone company also is preparing to install a big exchange at Fort Sam Houston to include 750 direct telephones to all the departments at department headquarters, Camp Wilson, Leon Springs, Aviation Camp and sub-divisions of these departments. The installation of this new exchange will mean the addition of at least another 500 telephones for private and commercial use outside of the army exchange.

VIRGINIA

A new telephone is being constructed in Staunton from West View-Christians and will be known by that name with number 54. The wires are being strung by the subscribers and will be connected with the C. and P. exchange. There are about 15 on the line. This is the second line within a few weeks which has been constructed by farmers and connected with Staunton.

Billy Sunday Aids Connection

Billy Sunday, evangelist, indirectly brought about a practical merger of the two telephone companies of Los Angeles. For on the eleventh floor of the Wright & Callender building, occupied entirely by the Billy Sunday campaign committee, the first switchboard into which run trunk lines of both the Home and Sunset Telephone Companies has been installed.

As a result there are only eight stations, local lines in the rooms of the headquarters, where otherwise there would be 16. Two trunk lines from each company run into the switchboard, which is ably handled by Miss Eunice Lovering, who bears the distinction of being the first telephone operator in Los Angeles to handle one of the new switchboards.

"And Billy Sunday sure keeps the telephone busy all day, even though he is not here," said the operator. "My, I wonder what it will be when he does arrive.

"Of course we do have some awfully silly calls concerning Billy Sunday. Just today a woman called up and wanted to know what Billy Sunday looked like and if he wore a mustache. But then most of the calls are from people seeking legitimate information.

"And so many of them call up and want to know if there is not some way in which they can aid the Billy Sunday campaign. I always switch them right in on either Dr. John A. Eby's line or Dr. James E. Walker's line."